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FEB 26 1988

OCS REPORT
MMS 84-0053

FINAL
AREA-WIDE ENVIRONMENTAL ASSESSMENT
EXPLORATION AND PRODUCTION ACTIVITIES FOUR-MILE ZONE OF THE EAST AND WEST FLOWER GARDEN BANKS

GULF OF MEXICO
OUTER CONTINENTAL SHELF
REGIONAL OFFICE

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U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE

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Exploration and Production Activities
Four-Mile Zone of
The East and West Flower Garden Banks

Prepared by the
MINERALS MANAGEMENT SERVICE
GULF OF MEXICO
OUTER CONTINENTAL SHELF
REGIONAL OFFICE

October, 1984

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ABBREVIATIONS AND ACRONYMS

AEA	Area-Wide Environmental Assessment
BOD	Biological Oxygen Demand
CER	Categorical Exclusion Review
COE	(U.S. Army) Corps of Engineers
DO	Dissolved Oxygen
EIS	Environmental Impact Statement
ER	Environmental Report
FREIS	Final Regional Environmental Impact Statement (USDI, MMS, 1983b)
FWS	Fish and Wildlife Service
GOM	Gulf of Mexico
MMS	Minerals Management Service
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
PSD	Prevention of Significant Deterioration
ORD	Regional Director (of MMS)
SEA	Site-Specific Environmental Assessment
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

INTRODUCTION

This Area-Wide Environmental Assessment is written for exploration, development, and production activity occurring within the four mile zone of the East and West Flower Garden Banks. The boundaries for the AEA are shown in Figure A. The relationship of the AEA area to the coast is shown in Figure B. This AEA will serve as a base document for oil and gas activity proposed within the environmental assessment area. A Site-Specific Environmental Assessment will be prepared for each plan submitted for activities within the AEA area. The SEAs will contain site-specific and updated information not presented in the AEA. Sections of the AEA which will be covered or supplemented in an SEA are indicated throughout the text.

In compliance with the National Environmental Policy Act, this AEA/SEA concept implements the tiering process outlined in 40 CFR 1502.20 which encourages agencies to tier environmental documents to eliminate repetitive discussions of the same issue. The SEA will conform to the guidelines for preparing environmental assessments in compliance with the requirements of 30 CFR 250.34 and NEPA using information presented in the base document. The determination of whether a Finding of No Significant Impact is applicable will be made in each SEA prepared for plans submitted for blocks within the area.

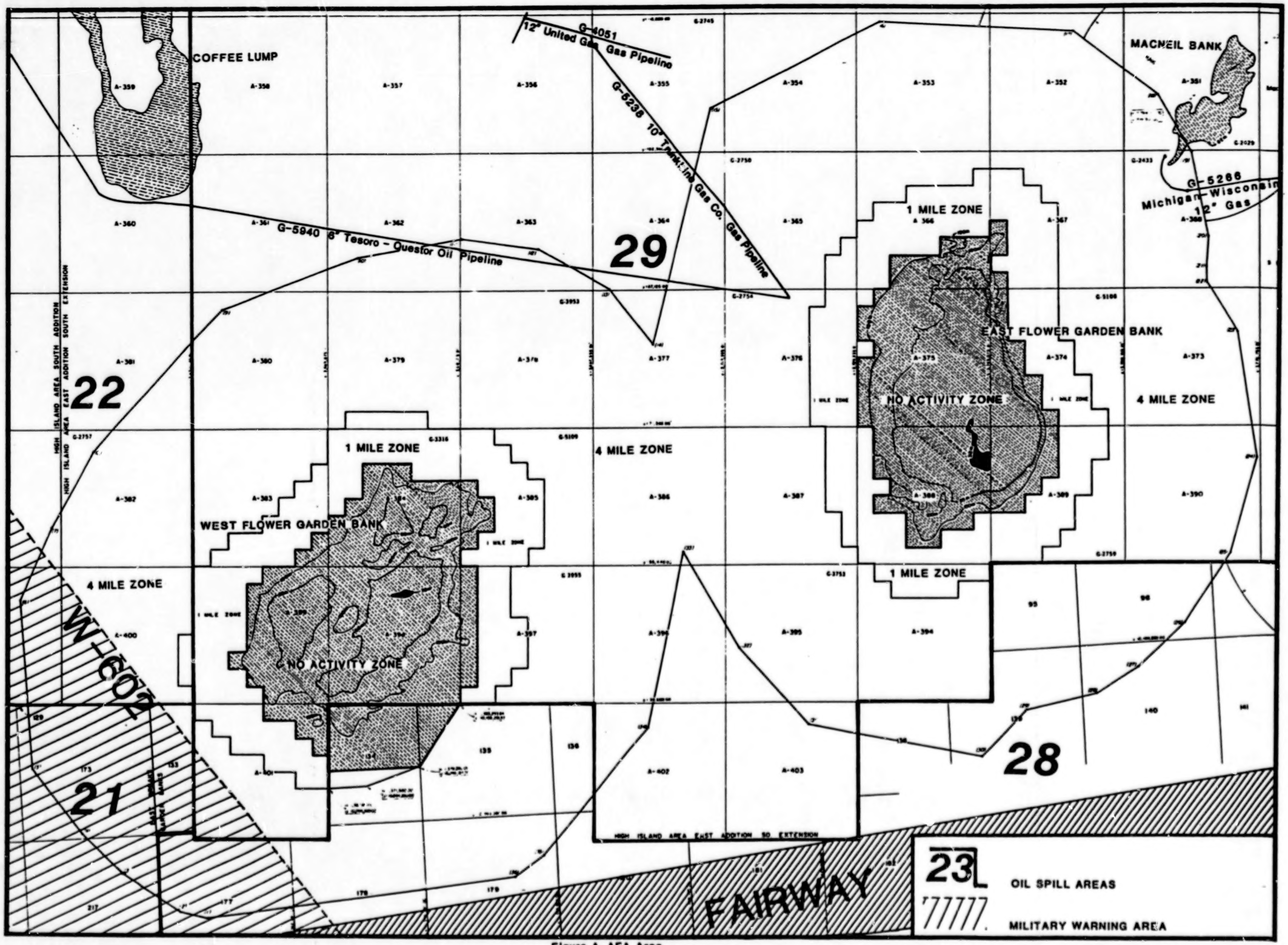

Figure A. AEA Area

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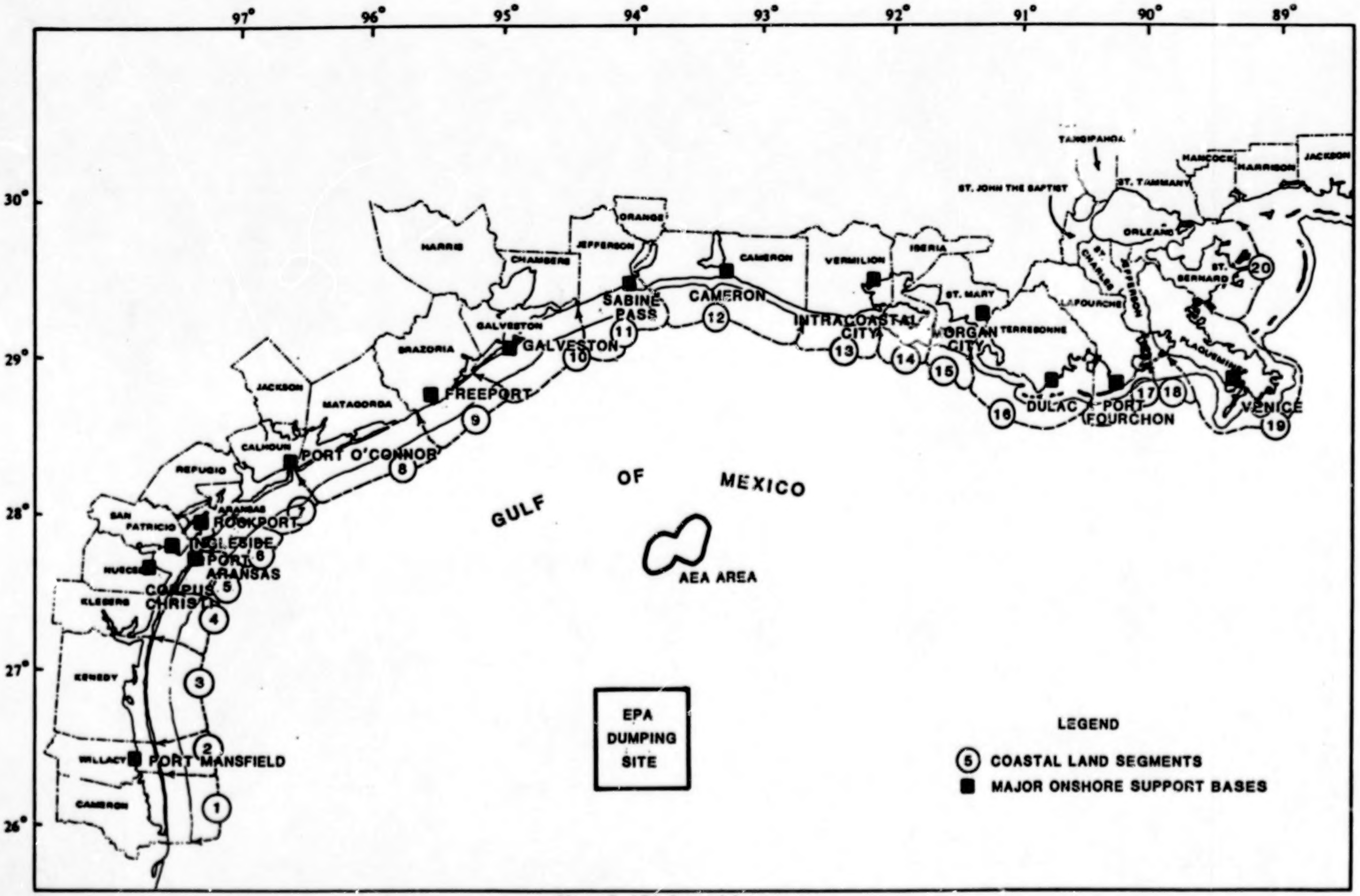

Figure B. AEA Coastal Area

I. DESCRIPTION OF PROPOSED ACTION

The following sections will be addressed in an SEA.

A. GENERAL

B. EQUIPMENT AND SUPPORT SYSTEMS

C. SCHEDULE OF ACTIVITIES

D. TRANSPORTATION ROUTES

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K. NEARBY PENDING ACTIONS

II. ALTERNATIVES TO PROPOSED ACTION

This section will be addressed in an SEA.

III. DESCRIPTION OF AFFECTED ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Environmental Geology and Hazards

a. General Description of Geology

The East and West Flower Garden Banks are located near the shelf edge approximately 198km (107 nm) due south of Sabine Pass (Figure B). The Flower Garden Banks are similar in origin, general structure, and sediment distribution, but differ in the details of structure, physiography, and sedimentology.

The East Flower Garden Bank located at 27° 54' 32"N latitude and 93° 36'W longitude, is pear-shaped, and covers an area of about 67km^2 (26 mi^2) (Figure A). Slopes are steep on the east and south sides of this bank, with gentle slopes on the west and north sides. Water depth in the vicinity of the bank ranges from about 20m (66 ft) in the northeastern part of High Island Block A-388, with some coral heads extending as shallow as 11m (36 ft), to 136m (446 ft) in an elongate depression in the north central part of High Island Block A-389 (Figure III-1). Total relief on the bank is 116m (381 ft) (Rezak et al., 1983).

The West Flower Garden Bank is located 12km (7 mi) west of the East Flower Garden at latitude 27° 52' 27"N, longitude 93° 48' 47"W (Figure A). A much larger bank, the West Flower Garden covers about 137km^2 (53 mi^2). The bank is oval-shaped and oriented in a northeast-southwest direction. The crest of the bank lies at a water depth of approximately 20m (66 ft). Surrounding depths vary from 100m (328 ft) to the north to 150m (492 ft) to the south. Total relief on the bank is approximately 130m (427 ft) (Figure III-2) (Ibid).

Physiography and Structure

The East and West Flower Garden Banks are bathymetric prominences caused by salt diapirs which are capped by living coral reefs at the crests. The bedrock outcrops on the seafloor at the crests of these prominences caused by the fracturing of the rocks overlying the salt diapir served as substrates for the initial growth of reef-building organisms. The East Flower Garden can be classified as a young salt dome, and the West Flower Garden as a mature salt dome (Ibid).

The major fault trends on the East Flower Garden Bank are west-northwest to east-southeast, with minor trends towards the northeast and the southeast (Figure III-3). North-South profiles show the faulting to be step-like, upslope, down-faulting typical of the tensional fractures produced during the domal uplift of sedimentary rocks over salt domes (Figure III-4). The central graben has developed partly due to the tensional stresses developed during uplift and to the removal of salt from the crest of the ridge by dissolution. It is expected that fault movements will continue as long as salt is being dissolved from the crest of the salt stock (Ibid).

A brine seep complex is located at the East Flower Garden Bank. The primary brine system consists of interrelated components; 1-brine seep, 2-brine lake, 3-overflow, 4-canyon with mixing stream (Figure III-5). The basin containing the brine lake is 60m (197 ft) from the edge of the bank, 4m (13 ft) deep, oval-shaped, and 30-50m (98-164 ft) wide. The brine lake,

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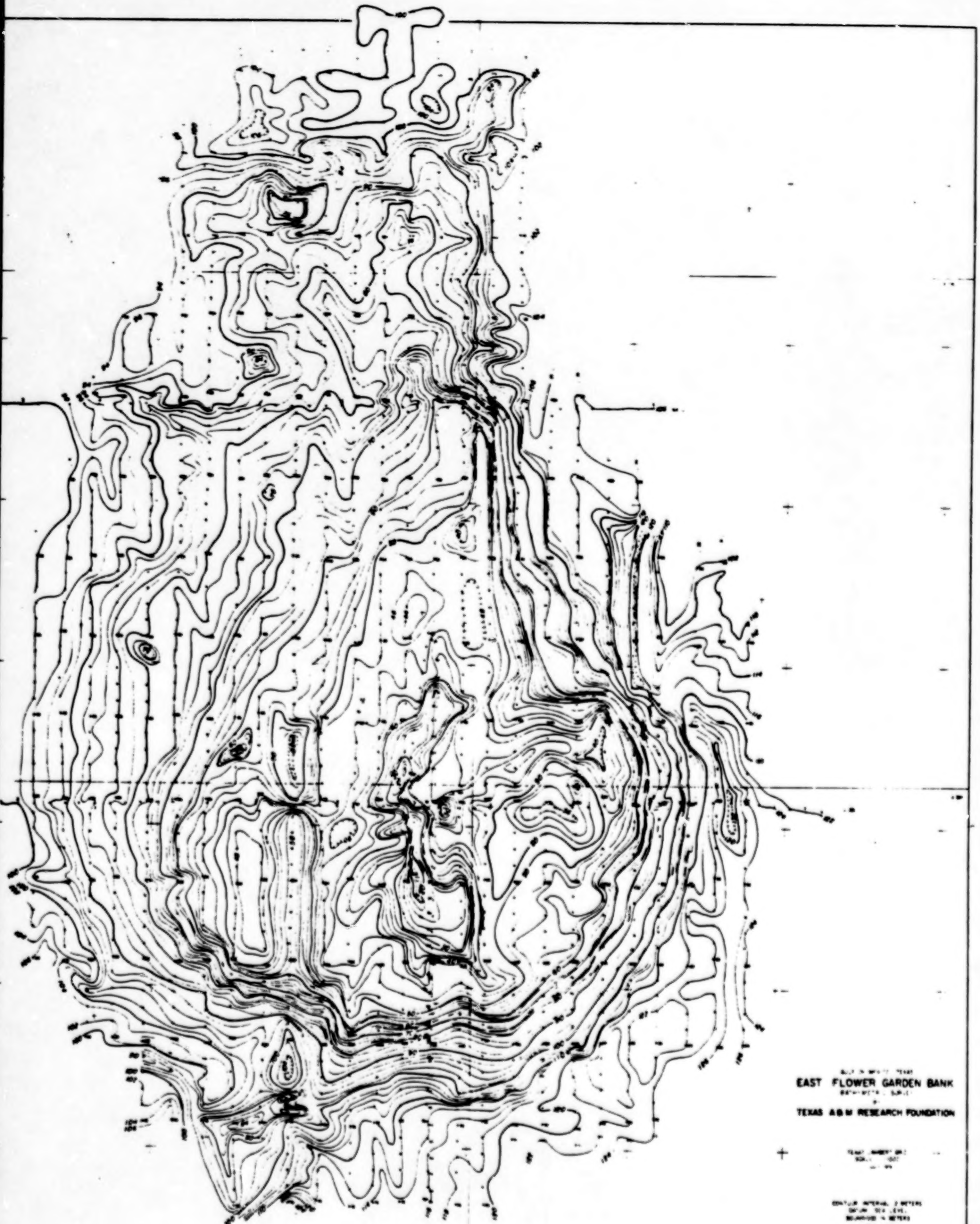

Figure III-1 East Flower Garden Bank Bathymetry Source: Rezak et al., 1981.

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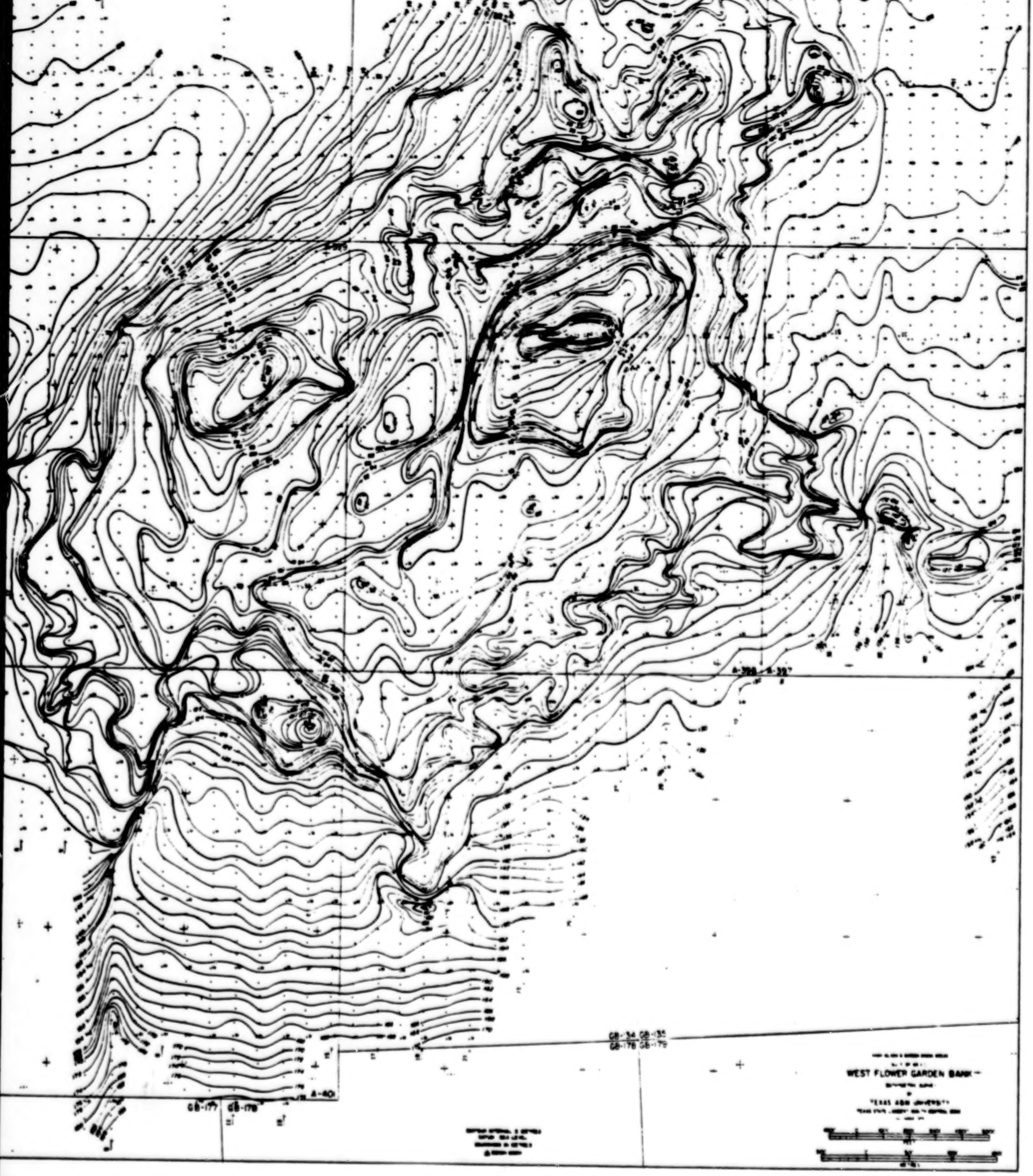

Figure III-2 West Flower Garden Bank Bathymetry Source: Rezak et al., 1981.

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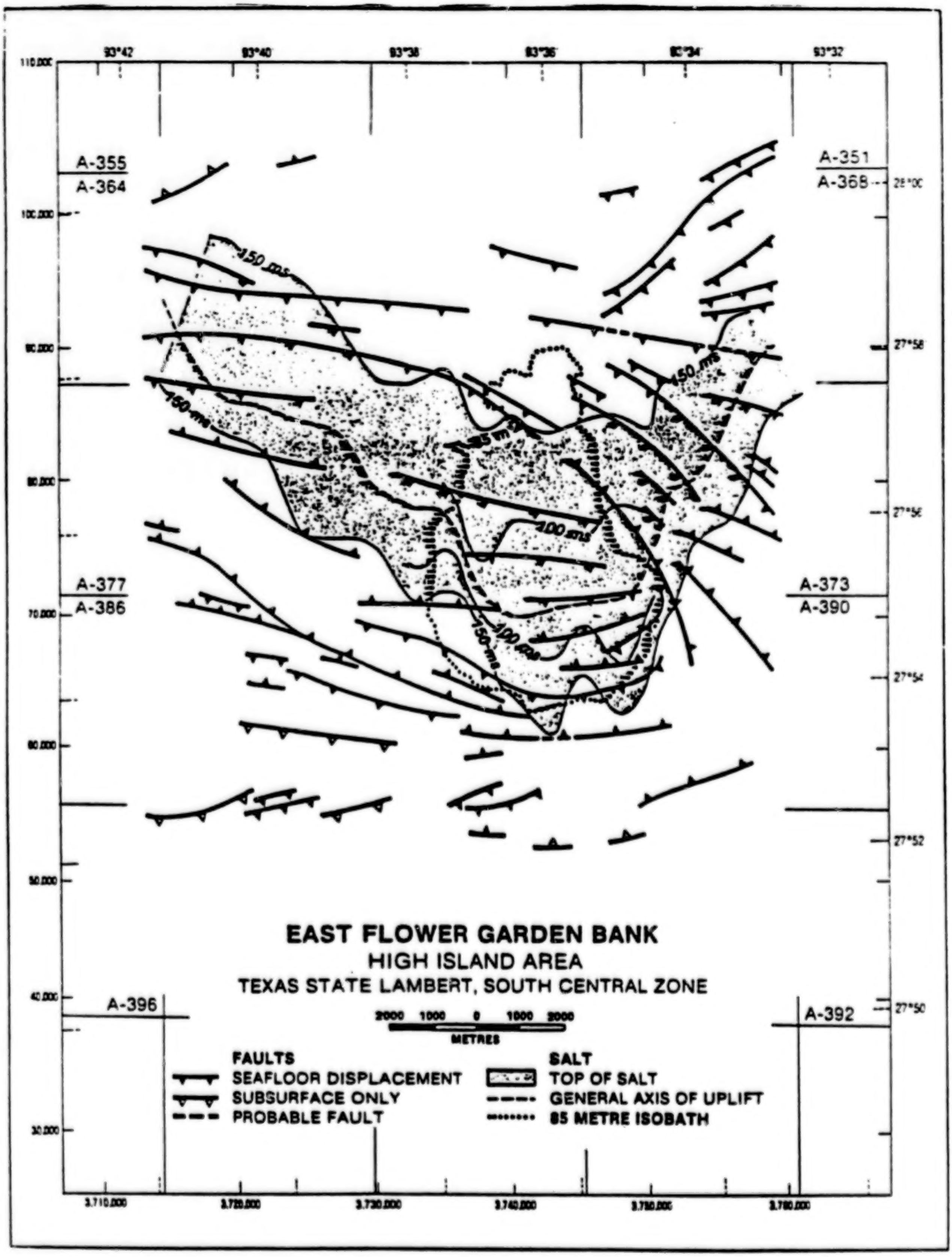

Figure III-3 Structure Map of the East Flower Garden Bank Region - The dotted line delineating the 85m isobath is given to indicate the shape of the bank proper.

Source: Rezak et al., 1983.

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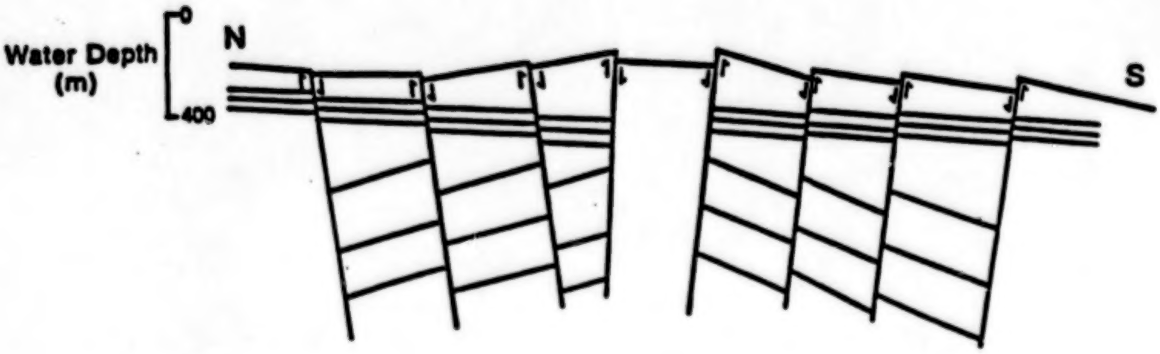

Figure III-4 Diagrammatic Representation of Step Faulting at the East Flower Garden Bank

Source: Rezak et al., 1983.

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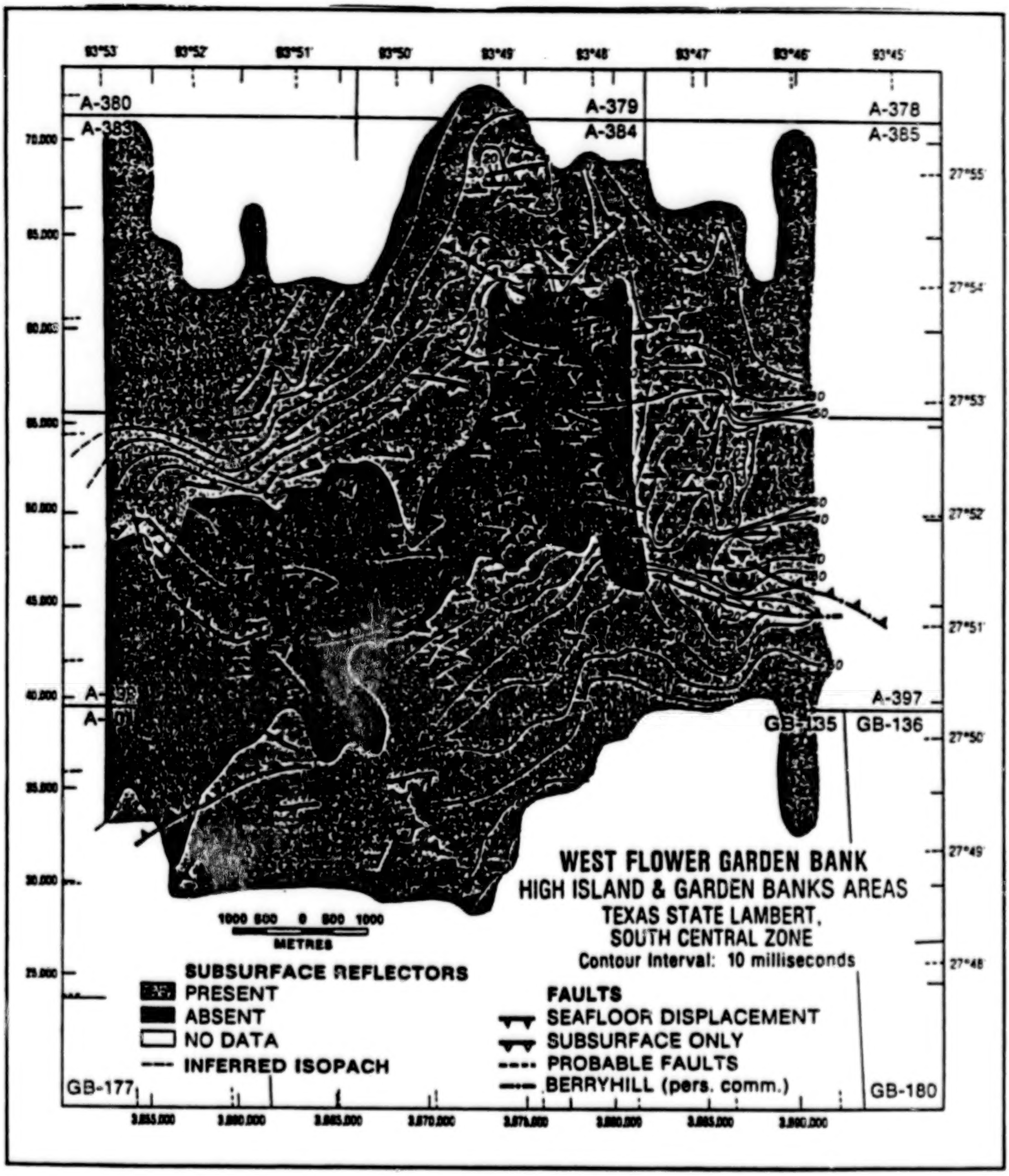

Figure III-6 Structure Map of West Flower Garden Bank
Source: Rezak et al., 1983.

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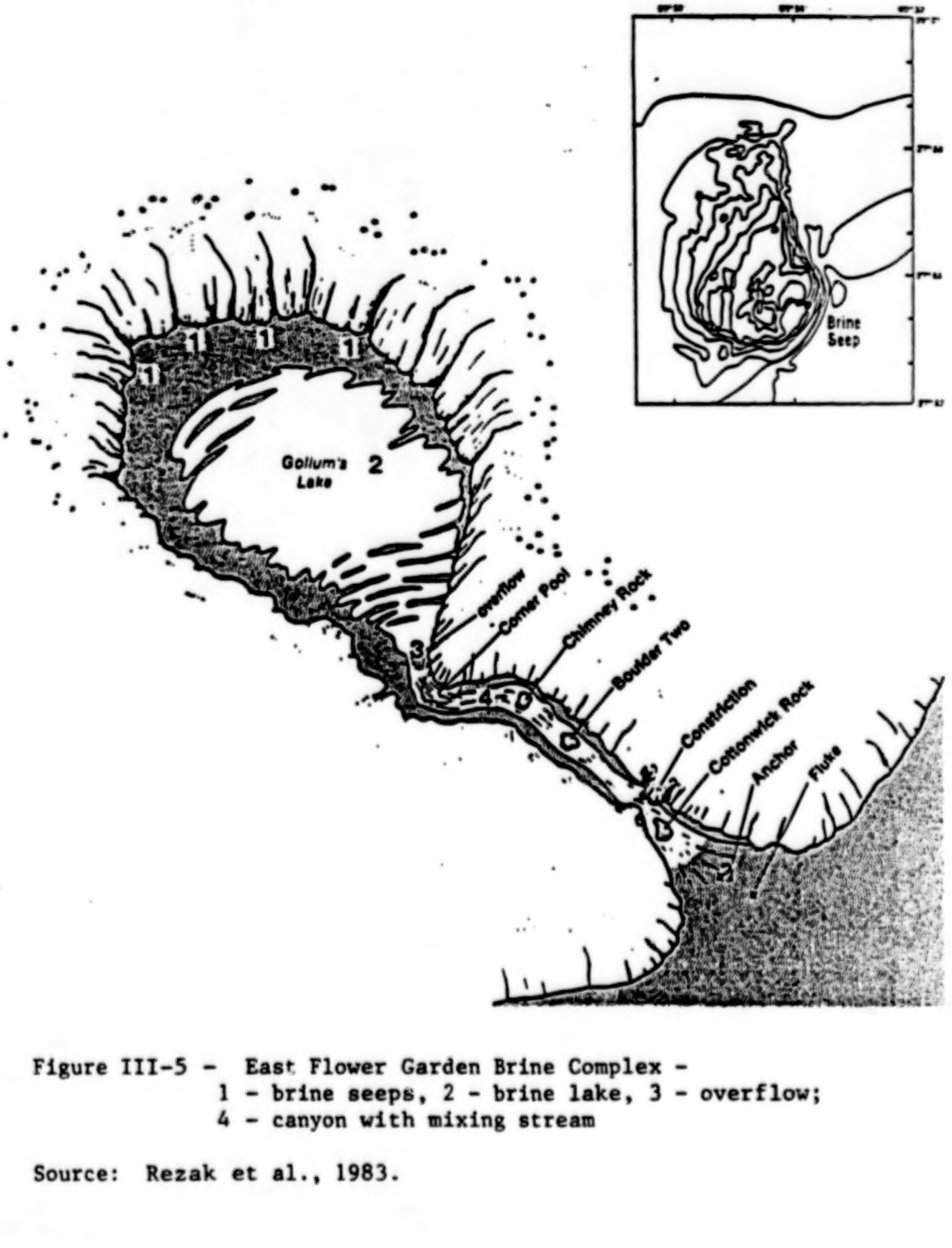

Figure III-5 - East Flower Garden Brine Complex -
1 - brine seeps, 2 - brine lake, 3 - overflow;
4 - canyon with mixing stream

Source: Rezak et al., 1983.

approximately 25cm (10 in) deep, occupies part of the slightly lower eastern and central basin floor at 71m (233 ft) depth. The lake is irregular in shape with a cuspate "shoreline." Numerous brine seeps occur in the sandy bottoms between the "shoreline" and reef rock wall of the basin. Dendritic rivulets of brine have been observed in sands along the shoreline leading from the seep to the lake. The canyon, approximately 60m (197 ft) long, extends from the east-southeast margin of the basin to the edge of the bank (Ibid).

The residence time of brine in the basin is less than one day. The lake, 25-30m (82-98 ft) long, 15-20m (49-66 ft) wide, and generally less than 0.25m (10 in) thick, contains approximately 465m^3 (3900 bbls) of brine. The overflow rate of brine from the lake into the canyon, calculated by current meter and direct measurement of outflow cross-section area, was determined to be 355-717m^3/day (2977-6014 bbls/day). Residence time is therefore 0.65-1.3 days. The depth of the brine lake and the overflow rate appeared unchanged during a four year observation period (1976 to 1980). Based upon measured outflow of the brine lake and the salinosity of brine in the lake, calculations show that the amount of solid salt being removed from the crest of the salt diapir ranges a minimum of 10,765m^3/yr (90,289 bbls/yr) to 21,710m^3/yr (182,088 bbls/yr). As other seeps are known to exist at the East Flower Garden Bank, this is a minimum range for the removal of solid salt.

The removal of such large volumes of solids beneath the crest of the bank would eventually create sizeable caverns beneath the cap rock and the overlying reef. Collapse of the crest of the reef into these caverns would depend upon the strength of the cap rock and the overlying reef. If these structures are weak, collapse would be gradual keeping pace with the removal of salt. However, if either the cap rock or reef is strong, the caverns may obtain considerable size before failure occurs and the collapse becomes catastrophic (Ibid).

Chemically, the brine has a higher density than seawater, is anoxic, and contains exceptionally high levels of dissolved hydrocarbon gases (methane, ethane, and propane) and hydrogen sulfide. The density differential inhibits mixing of the lake brine with overlying seawater. Because of the lack of mixing, chemical characteristics of water above and below the interface differ drastically over a vertical distance of less than 2cm (.8 in) (e.g., salinity: 36.7 ppt vs. 200 ppt) (Ibid).

Because the West Flower Garden Bank is a much older salt dome, local relief on the West Flower Garden Bank is much greater than at the East Flower Garden Bank. Although the structure of both banks is the result of normal faulting, more movement has occurred along the faults at the West Flower Garden. The chief source of these structural differences is the greater amount of salt removal at the West Flower Garden Bank (Ibid).

The structure of the West Flower Garden Bank is typical of a mature salt diapir in which crestal faulting has occurred. The crestal graben at the West Flower Garden Bank, which extends from the southeast corner of Block A-399 to the southeast corner of Block A-384, exhibits much greater relief than the crestal graben at the East Flower Garden Bank. The West Flower Garden Bank has an abundance of normal faults. The numerous bathymetric prominences on the bank represent horsts that stand above the surrounding graben (Figures III-2 and III-6) (Ibid).

The living reef lies in the north-central portion of Block A-398. Rising from depths of 40-50m (131-164 ft) it crests at about 20m (66 ft). Extending from near the base of the reef towards the northeast and the south is a broad terrace that extends to depths of 60-70m (197-230 ft). The surface of this terrace is characterized by large waves of sediment consisting primarily of the Coral Debris Facies sand and gravels of the Gypsina - Lithothamnium Facies. The gravel waves are oriented normal to the isobaths. Below these depths are numerous lineations (faults and outcrops of tertiary bedrock covered by drowned reefs) and patch reefs scattered to depths as great as 170m (558 ft). Most of the patch reefs above 90m (295 ft) appear to have formed during the last rise of sea level (Figures III-2 and III-6) (Ibid).

Sedimentary Facies

Sediment distribution in the Flower Garden Bank area is illustrated in Figure III-7. As illustrated, the sediments of the two banks differ markedly in origin from the sediments of the open shelf surrounding the banks. Bank sediments are all derived from the skeletons of organisms that are living on the banks. The normal sediments in the open shelf surrounding the banks are sands and muds that have been eroded from the North American continent and mechanically transported to the Gulf of Mexico by streams such as the Mississippi, Trinity, Sabine, and Brazos Rivers. These sands and muds do not occur at depths shallower than 75m (246 ft) at the Flower Garden Banks. The sediments above the 75m (246 ft) level are all coarse sands and gravels and the rocky limestone structure built by the corals and other reef-dwelling organisms. The loose sediments around the reef reflect the depth zonation of the biological communities that are present on the two banks. Table III-1 illustrates the relationship between the biological zones and the sediment facies (Ibid).

As indicated in Table III-1, the sediment facies are intimately related to the biological zonation and hydrological conditions at each bank. However, the distribution of the sediment types does not coincide with the boundaries between biotic communities, partly due to the downslope movement of loose sediment by the force of gravity and partly due to the use of soft-bodied organisms in delineating the biotic zonation. In Table III-1, for example, the lower boundary of the Algal-Sponge biotic zone is based upon the lower depth limit of Neofibularia, a colonial, soft-bodied sponge which also grows in the upper part of the Amphistegina Sand Facies. Knowledge of the distribution of the living, lime secreting, skeletal organisms has determined that the direction of sediment transport on the banks is downslope. This in combination with the fact that there is no land-derived mud in the bottom sediments above a depth of 75m (246 ft), substantiates the conclusion from water and sediment dynamics studies that the currents flow around the banks rather than up and over them [the nepheloid layer rarely rises to depths of 75m (246 ft)]. Any fine sediments, such as occur below the 75m (246 ft) depth, would be trapped in the irregular topography of the living reefs or Gypsina - Lithothamnium Facies if they were ever carried to the top of the reef by either physical or biological processes (Ibid).

b. Potential Geologic Hazards

For a detailed description of geohazards in the Western and Central Gulf, see Volume I, Section III.A.1 of the FREIS. Geologica hazards are also discussed in Section IV.B.1. of this AEA, "Impacts Concerning Geology." Because the analysis area is limited to only a small number of lease blocks in this area, any additional discussion of the potential geologic hazards in the AEA area will be addressed on a block by block basis in an SEA.

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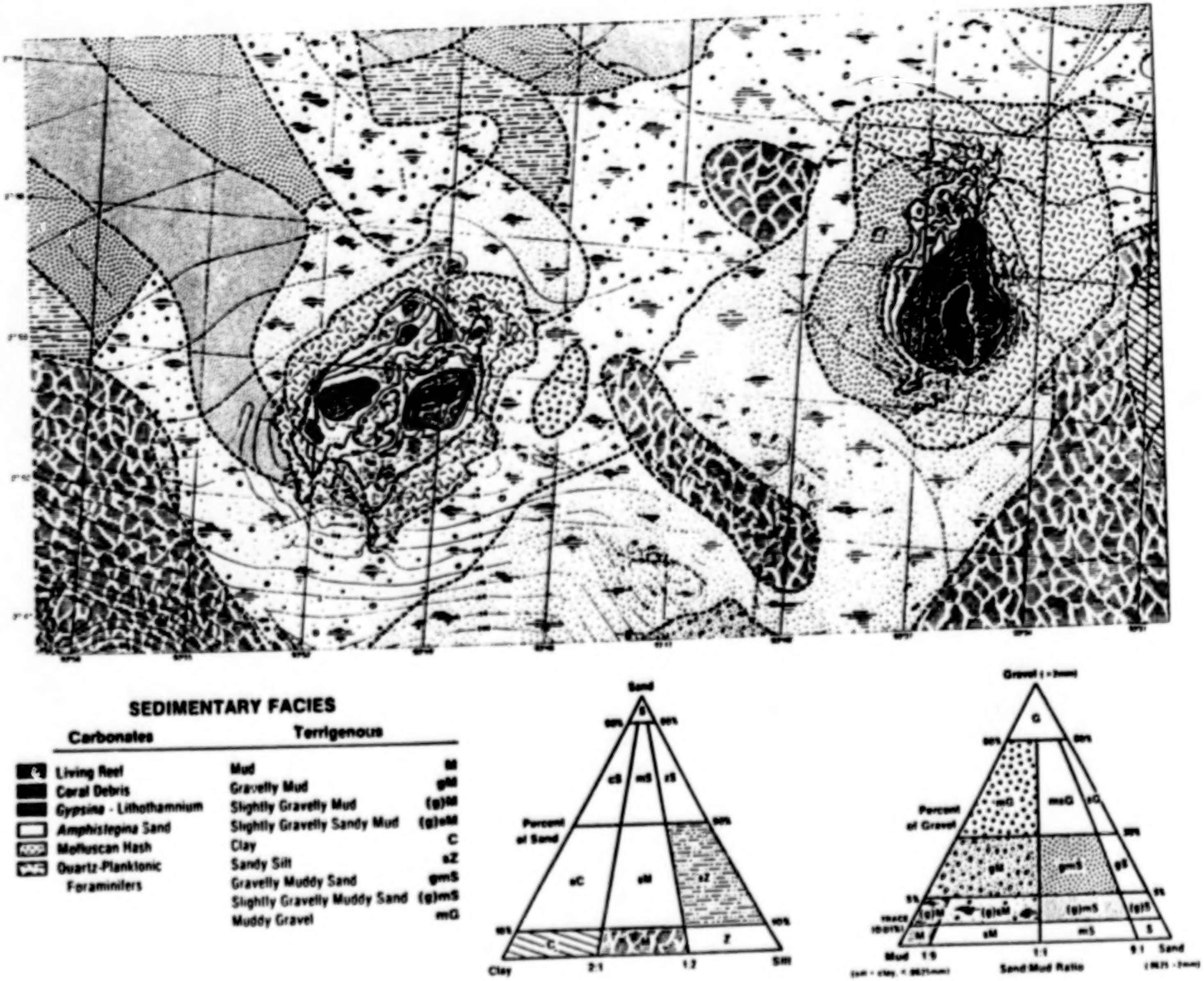

Figure III-7 Sediment Facies in the Flower Garden Banks Area
Source: Rezak et al., 1983.

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Table III-1

Relationship Between Sediment Facies and Biological Zones at the East Flower Garden Bank

SEDIMENT FACIES	DEPTH (m)	BIOLOGICAL ZONE	DEPTH (m)
1. Coral Reef	15-50	1. *Montastrea-Diploria Porites*	15-36
a. Living Reef (massive limestone)	15-45		
b. Coral Debris (coarse sand and gravel)	25-50	2. *Madracis*	28-46
		3. *Stephanocoenia*	36-52
2. *Gypsina-Lithothamnium*	50-75	4. Algal-Sponge	46-88
3. *Amphistegina* Sand (medium to coarse sand, muddy at depths greater than 85m)	75-90	5. Transition	88-89
4. Quartz-Planktonic Forminifers (sandy mud)	90+	6. Nepheloid	89
5. Molluscan Hash (muddy sand)	90+		

Source: Rezak et al., 1983.

c. Petroleum Geology

The prospective horizons of the northwestern continental shelf are of Miocene, Pliocene, or Pleistocene age. The environment of deposition of the continental shelf and slope in the northern Gulf of Mexico is one of the most significant factors controlling hydrocarbon production. Sediments deposited on the outer shelf and upper slope have the greatest potential for bearing hydrocarbons because this environment is the optimum zone for encountering the three ingredients necessary for the successful formation and accumulation of oil and gas: reservoir rock, source beds, and traps (USDI, MMS, 1983a).

There are approximately 420 fields on the Federal OCS of the Gulf of Mexico. Of these, 304 primarily produce gas and 90 primarily produce oil. In the remaining 26, production or productivity has not yet been determined. Production depths range from about 300-5,500m (984-18,046 ft), with most production occurring between 2,600m (8,531 ft) and 3,900m (12,796 ft). USGS records show that 4,954 billion bbls of oil and condensate and 44.5 tcf of gas have been produced from Federal OCS lands as of December 31, 1979 (Ibid).

The most prolific offshore production comes from the Miocene of the eastern Louisiana OCS. This area, as currently defined, has more oil than the remainder of the Texas-Louisiana area. The next most productive trend is the Pliocene trend of the central Louisiana OCS which produces about 50% oil and 50% gas. Further to the west this producing trend dies out. The Miocene of western Louisiana is the third most productive trend, producing mostly gas, and the Pleistocene of offshore western Louisiana ranks fourth. For a more detailed description of prospective geologic horizons, see Volume 1, Section III.A.1. of the FREIS (Ibid).

Hydrocarbon reserves around the Flower Garden Banks are expected to be natural gas. The Flower Garden Banks overlie a known area of shallow gas deposit, the Pleistocene trend stretching approximately 160km (87 mi) along the outer edge of the continental shelf (USDC, NOAA, 1979).

2. Meteorological Conditions

The northwestern Gulf of Mexico is influenced by a maritime subtropical climate determined by four major factors: the North American continental land mass, the Azores-Bermuda high pressure cell, a subtropical latitude, and relatively warm waters of the Gulf of Mexico, which is the principal influence. The clockwise wind circulation around a semi-permanent area of high barometric pressure results in the predominance of moist southeasterly wind flow over the northwestern Gulf. Another factor influencing the weather in this area is the predominance of high barometric pressure over the North American continent during the winter months, resulting in rare periods of relatively dry northerly wind flow. Refer to the FREIS for additional details (USDI, MMS, 1983b).

a. Temperature

Average temperatures at coastal locations vary with latitude and exposure. In winter they depend on the frequency and intensity of penetration by polar air masses from the north. These incursions, when they bring strong northerly winds, are called "northers" and may occur some 15-30 times between November and March. Air temperatures over the open Gulf are typical of a maritime climate and exhibit narrower limits of variations in both a daily and seasonal basis. The average temperature over the center of the Gulf is about 29°C (84°F) in the summer and between 17°-23°C (63°-73°F) in the winter (USDI, MMS, 1983b).

b. Cloudiness and Visibility

On a yearly average, four to six tenths of the sky is obscured by cloud cover and there is relatively little seasonal variation. October is usually the most cloud free month and December through March the cloudiest. The clouds in the winter season are mostly widespread stratus type clouds while the summer clouds are cumulus type.

Warm, moist Gulf air blowing slowly over chilled land or water surface brings about the formation of fog. Fog occurrence decreases seaward but visibility has been less than ½ mile due to offshore fog. Most fog forms during the early morning and usually lasts three to four hours, although particularly dense sea fogs may persist for several days. Poorest visibility conditions occur during winter and early spring. The period from November to April has the highest frequencies of low visibility due to fog. On the South Texas coast, fog reduces visibility to less than 5/8 of a mile on an average of 28 days/year; very dense fog in Galveston reduces visibility to 3/8 of a mile about 16 days/year; and Port Arthur has an average of 42 days/year with visibility less than 3/8 of a mile (USDI, MMS, 1983b).

c. Wind

Winds are more variable near the coast than over open waters because coastal winds are more directly influenced by the moving cyclonic storms that are characteristic of the continent and because of the sea and land breeze regime. The Azores-Bermuda atmospheric high pressure cell dominates circulation over the Gulf, particularly during the spring and summer months. In late summer there is a general northward shift of the circulation, and the Gulf becomes more directly influenced by the equatorial low pressure cell. During the relatively constant summer conditions, the southerly positions of the Azores-Bermuda cell generates predominantly southeasterly winds which become more southerly in the northern Gulf. Winter winds usually blow from easterly directions with fewer southerlies but more northerlies. Winds from the west and southwest are rare at anytime during the year (USDI, MMS, 1983b). During the spring and summer months the predominently southeasterly winds average around 16km/hr (10 mph), but vary near shore because of the land and sea breeze effect. Winds may be calm during any time of the year, but can also reach as high as 324km/hr (201 mph) during hurricanes or 200km/hr (124 mph) in intense winter storms.

d. Precipitation

Precipitation is frequent and abundant in the GOM throughout the year but does show distinct seasonal variation. Stations along the entire coast record the highest precipitation values during the warmer months of the year. The warmer months usually have convective cloud systems which produce showers and thunderstorms; however, these thunderstorms rarely cause any damage or have attendant hail. The month of maximum rainfall for most locations is July; however, Brownsville's record maximum is in September. Winter rains are

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usually associated with the frequent passage of frontal systems through the area. Rainfalls are generally slow, steady, and continuous, often lasting several days (USDI, MMS, 1983b).

Average annual precipitation along the Gulf coast increases from 69cm (27 in) at Brownsville to over 102cm (40 in) at Galveston and 135cm (53 in) at New Orleans. Rainfall is fairly evenly distributed throughout the year with the greatest amounts occurring in June, July, and August, when the winds are predominantly out of the south and southeast. This does not imply a continuity of precipitation for the South Texas Region. Snowfalls are rare and the incidence of frozen precipitation decreases with the distance offshore.

e. Severe Weather

Storm approach for a hurricane is marked by rising tides and increased wind velocities. Generally, the longer a storm lingers in the Gulf, the larger the surge of water it pushes ashore as it approaches land. There is no preferred approaching route of hurricane tracks, although early season storms generally approach from the southeast while later ones are more out of the south. Most hurricanes form in tropical ocean areas; however, a few are generated in the Gulf of Mexico. From 1901-1971, seven hurricanes and seven tropical storms formed in the Gulf north of 25°N and east of 85°W (USDI, MMS, 1983b).

Hurricane damage results from high winds and, particularly in the coastal areas, the storm surge or tide which is an abnormally high rise in the water level. Maximum surge height at any location is dependent on many factors including bottom topography, coastline configuration, and storm intensity. The storm surge associated with Hurricane Betsy in 1965 reached nearly 6m (20 ft) at Bayou Lafourche; however, Hurricane Carla in 1961 produced 7m (23 ft) tides in Lavaca Bay, Texas. Hurricane Camille, the most severe hurricane in recent Gulf history, attained top winds estimated at 324km/hr (201 mph) with barometric pressure in her eye as low as 68cm (27 in) of mercury (Ibid).

The largest and most destructive storms affecting the Gulf of Mexico and adjacent coastal zones are tropical cyclones which have their origin over the warm tropical waters of the central Atlantic Ocean, Caribbean Sea, or southeastern Gulf of Mexico. Tropical cyclones occur most frequently between June and late October, and there is a relatively high probability that they will cause damage in the Gulf each year. Tropical cyclones originate in middle and high latitudes forming on the fronts that separate different air masses. Extratropical cyclones which may vary greatly in intensity occur primarily during the winter months and have attained wind speeds as great as 55-93km/hr (34-58 mph). The Gulf of Mexico is an area of cyclone development during the cooler months due to the contrast in temperatures of the warm air over Gulf waters and the cold continental air over the United States. These storms rapidly dissipate after entering the Gulf of Mexico (Ibid). Table III-2 gives the recurrence of tropical cyclones and hurricanes for the Central and Western Gulf.

Table III-2

Storm Activity

Area	Tropical Cyclones Winds (34 Kns) 17.5 m/sec	Hurricanes Winds (64 Kns) 32.9 m/sec	Total No. Hurricanes 1899-1971	Possible Storm Surge
Corpus Christi	1.8 yrs	2.9 yrs	25	3-7.6m (10-25 ft)
Galveston	2.1 yrs	3.2 yrs	23	3-7.6m (10-25 ft)
Sabine Pass	2.3 yrs	4.9 yrs	15	3-7.6m (10-25 ft)
Bayou LaFourche	1.6 yrs	4.1 yrs	18	Above normal
Southwest Pass	1.5 yrs	4.1 yrs	18	Above normal

Source: USDI, MMS, 1983a, Visual No. 6.

3. Physical Oceanography

a. Sea Temperature and Salinity

Repeated cold air outbreaks cool the surface waters in the vicinity of the Flower Garden Banks in the winter, and mix them down to 70m (230 ft) by January. Minimum temperatures in this layer are approximately 19.5°C (67.1°F). The thickness of the mixed layer decreases through the spring as the number and intensity of the polar cold air outbreaks decline. Rapid warming begins in April, so that by June there is a strong thermocline with a surface mixed layer of minimal thickness. As surface heating continues through the summer, the surface mixed layer thickens and temperature increases from about 28°C (82°F) in June to about 30°C (86°F) in August. In late September to early October the polar fronts again push their way towards the Flower Garden Banks. Wind mixing and destabilization of the density structure by surface cooling cause the surface mixed layer to thicken and decrease in temperature once again (Rezak et al., 1983).

The minimum vertical temperature gradient in the vicinity of the Flower Garden Banks occurs in late February. At that time the surface mixed layer is 30 to 50m (98 to 164 ft) thick with temperatures in the range of 19 to 20°C (66 to 68°F). Temperatures at the bottom [125m (410 ft)] at that time are 17 to 18°C (63 to 64°F). From February through late March the mean temperature remains near 20°C (68°F) with very modest variance. In late March when the temperature begins to reach 20.5°C (68.9°F), there is an onset of rather large one-and-two-day oscillations in the temperature. This is at very time that the base of the mixed layer rises above 30m (98 ft) so that the top of the Flower Garden Banks is in the thermocline. The large excursions in temperature are the result of vertical oscillations of the thermocline isotherms past the fixed measurement point. Such excursions are caused by inertial currents, shelf waves, and tides (Ibid).

A mean mixed layer depth of about 35m (115 ft) is evident in October. A significantly thicker mixed surface layer located downstream of the East Flower Garden Bank was also evident at this time. This thickening appears to be an orographic effect. The temperature in the surface mixed layer is approximately 27°C (80.6°F). A strong thermocline exists below the mixed layer. In July, a warm [30°C (86°F)], thin [13m (43 ft)] surface mixed layer is evident with a strong thermocline beneath it (Ibid).

Bottom temperatures at the shelf edge near the Flower Garden Banks undergo a peculiar double yearly cycle of minimums [17°C (63°F)] and maximums [20°C (68°F)]. The minimums occur in spring (March-April) and mid-summer (July-August), whereas the maximums occur in early summer (May-June) and mid-winter (November-January) (Ibid).

In October and March, salinities are slightly over 36 ppt. A slight depression of the salinity in the 13m (43 ft) thick surface mixed layer to about 35.5 ppt occurs in July. There are, however, major year-to-year variations in mid-summer surface salinity at the shelf edge. For example, in July 1979, surface salinity at the southwest margin of the East Flower Garden Bank was near 31.5 ppt, while salinity at 15m (49 ft) was over 35.5 ppt. It is therefore evident that the water of relatively low salinity did not reach the level of the reef crest at the Flower Garden Banks during this time (Ibid).

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b. Currents

The Flower Garden Banks lie in the eastward flowing shelf slope current and rise in water that does not mix all the way to the bottom in the winter. Due to the banks' location on the outermost edge of the widest point of the Gulf of Mexico continental shelf and because the volume of water decreases both east and west of the longitude of the shelf, continuity demands that along shelf flow in either direction must either diverge or slow in the vicinity of the banks or additional water must be drawn in from offshore to accommodate this increase in volume. Implications show that warmer offshore waters appear to have been drawn into the arch of the coastline. The salinity of the water also implies that the origin of the water is oceanic not coastal. (Rezak et al., 1983).

Flow at mid-depths at the shelf edge of the Texas-Louisiana segment is persistently to the east, often at speeds exceeding 15cm/s (6 in/s). More modest speeds [5cm/s (2 in/s)] were recorded in late winter (December-January) and mid-summer (June) (Ibid).

Near bottom currents tend to flow toward the east or southeast. In general, the stronger the flow the more southerly. The overall average for records in the 11 to 18m (36 to 59 ft) above the bottom group was toward the southeast at speeds between 1 and 5cm/s (.4 and 2 in/s). Bottom flow in the Flower Gardens region is much slower than the mid-depth flow, and oriented slightly more offshore (Ibid).

Two exceptions to the strong easterly flow of the mid-depth currents occurred in mid-July 1979, to mid-August 1979, and in December 1980. The cause of the anomalous flow (westward) in 1979 was the passage of Tropical Storm Claudette. After this storm passed over the Flower Gardens, the storm stalled over the Texas coast resulting in several days of high winds over the northwestern Gulf. In the second period of westerly currents, several very strong cold frontal passages took place, resulting in a vector average wind out of the northeast. The bottom currents in the Flower Garden Banks vicinity were directed primarily toward the southeast during these periods (Ibid).

c. Tides and Sea State

The tides of the Gulf of Mexico vary from diurnal (one high, one low tide per day) to mixed. Their influence on circulation in the area is mostly in and around bays, inlets, and the nearby coastline. The major tide variations are keyed to the declination of the moon. The tides at Galveston Bay, Texas, are classified as mixed diurnal. That is, there are two high and two lows to the water height each lunar day (24.84 hours) but with a large inequality between either the two highs or the two lows. The amplitudes of the three major tidal constituents [diurnal luni-solar tide (K_1), principal diurnal lunar tide (O_1), and principal semidiurnal lunar tide (M_2)] range from 9cm (4 in) to 12cm (5 in) (Rezak et al., 1983).

"Tidal currents" in the Gulf are generally very small except around inlets and barrier islands where maximum velocities may approach 100-150cm/sec (2-3 kns). On the shelf, the tidal component of the flow is relatively weak. Tidal current speeds throughout the year in the analysis area generally range from 1 to 5cm/s (0.4 to 2 in/s) for the M_2 constituent and from 2 to 5cm/s (0.8 to 2 in/s), but sometimes as high as 9cm/s (4 in/s) for the K_1 constituent (Ibid).

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Storm activity in the Garden Banks area may result in storm surge from 3-8m (10-26 ft) above normal water levels and large waves 9-14m (30-46 ft). The proximity, duration, strength, etc., of a storm determines the resultant surge and wave activity. Storm activity is discussed in detail in Section III.A.2.e. of this AEA. Table III-3 gives the annual frequency of various size classes of waves in the analysis area and Visual No. 6 of the EIS for Lease Sales 81 and 84 (USDI, MMS, 1983a) shows the recurrence of large waves.

Table III-3

Wave Height

Wave Height	Annual Percent Frequency
1-2 ft (0.3-0.6m)	26.1
3-9 ft (0.9-2.7m)	57.5
10-19 ft (3.0-5.8m)	2.4
20-+ ft (6.1-+m)	0.1

Source: USDI, MMS, 1983a, Visual No. 6.

4. Water Quality

Water quality - Water quality is based upon numerous factors including currents; freshwater inputs; nature and number of discharges; outfalls; and human activities that consist of municipal and industrial waste discharges, runoff, oil spillage, dredging, etc. In the past, water quality has been defined as the degree to which chemical concentrations and physical parameters within a water mass approach the ambient water state. Offshore water quality degradation in the Gulf of Mexico is associated primarily with effluent discharges by current offshore enterprises, consisting of OCS activities and marine transportation sources. Estuaries are characterized by a high dissolved oxygen concentration, low to medium coliform values, and medium chlorophyll a concentrations (USDI, MMS, 1983b).

Louisiana has many water quality problems that are affected by the discharge or release of factory wastes and domestic sewage into its rivers, bays, and estuaries. The most significant source of pollution in the Gulf is the outflow from the Mississippi River which drains more than 41% of the lands of the continental United States. This drainage results in the presence of high bacteria concentrations and toxic pollutants within the Mississippi River area, and is evidenced by high levels of organic pollutants found in Mississippi deltaic sediments. Industrial pollution is primarily from point sources outside the coastal zone proper, except in the Mississippi River which has considerable upstream pollution inputs. Aside from the input of the Mississippi River, the waters of the Calcasieu Basin have been subjected to significant toxin loads and add to the degradation of Louisiana's coastal waters. These toxins include heavy metals, organic toxins, oxidizable organic compounds, thermal effluents, and bacterial contaminants (Ibid).

The Texas coastal area has been plagued with numerous water quality problems in the past. Degradation of water quality occurs from many sources, including domestic and industrial effluents, dredging operations, agricultural runoff, shipping, offshore operations, etc.

The majority of the water quality problems existing in the Texas coastal region occur in an area from Sabine Pass to Lavaca Bay. Twenty-six percent of the Nation's refining capacity is located in Texas, which accounts for 40% of the Nation's petroleum output. The majority of these energy-related facilities are located in the Houston-Galveston and Beaumont-Port Arthur areas and contribute to water quality problems in the Eastern coastal region.

Coastal offshore water quality varies and is determined to a large extent by inshore water quality and the effects from freshwater discharge into the analysis area. As previously stated, cold water intrusions into the analysis area do occur as a result of high volume river/bay runoff. The average seasonal extent of these is about 100km (54 nm). This phenomenon could easily act as a transport mechanism for pollutants originating in river/bay areas. However, the effects of this are not known. A significant amount of dispersion takes place as these masses of water move offshore. Thus, offshore water quality is thought to be relatively unaffected and assumed to be near pristine in the analysis area. Further information on area water quality can be found in the FREIS (Ibid).

5. Air Quality

The air quality of the GOM coast varies considerably by local area; however, even with some violation of NAAQS, it is generally considered good.

Onshore - The AEA coastal area is in the USEPA Air Quality Control Regions 106, 213, 214, and 216. These areas are Class II attainment areas. A Class II attainment area allows residental, commercial, or industrial development as long as a Prevention of Significant Deterioration area is not violated. A PSD Class I area is cleaner than NAAQS for SO_2 or particulates. Breton Wilderness Area in Louisiana is the only part of the AEA area which has been classified as a PSD Class I area. The following parishes or counties do not meet the primary standard for O_3: Orleans, Jefferson, St. Bernard, Lafourche, and St. Mary Parishes and Jefferson, Galveston, Brazoria, and Nueces Counties; portions of Nueces and Cameron Counties do not meet the primary standards for TSP. The rest of the AEA coastal area is better than national standards for SO_2 and either better than national standards or cannot be classified for TSP, O_3, CO, and NO_2 (40 CFR 81). Air emissions relative to a designated onshore support base will be addressed in an SEA.

Offshore - The air quality of the offshore area affected by exploratory operations is considered good. One shipping lane crosses this area and the only other human activities are fishing, scuba diving, and research uses. Many of the pollutants found onshore are not prevalent in the OCS.

B. BIOLOGICAL ENVIRONMENT

1. Coastal Habitats

Wetlands - Three wetland habitats characterize the Louisiana and Texas coastal environment: seagrass beds, nonforested wetlands (marshes), and forested wetlands. A fourth wetland habitat, the black mangrove (*Avicennia germinans*), is scattered in the Chandeleur Sound off the Mississippi Delta and in Texas; however, due to the limited distribution and low probability of impact, the mangrove community will not be discussed. Table III-4 gives the acreage of the various coastal wetland habitats by county/parish in the assessment impact area. Visual No. 11 of the 81/84 EIS (USDI, MMS, 1983a) shows the general distribution of the various wetland habitats.

Coastal wetlands have several important functions. They contribute to the detrital input of surrounding waters, serve as nursery and refuge for various finfish and shellfish, aid in erosion control and substrate building, and provide habitat for a a variety of fish and wildlife species. Further explanation of the functions of coastal wetlands can be found in section B.1. of the *Regional Environmental Assessment For Pipeline Activities* (USDI, MMS, 1983c).

The seagrass beds in the assessment area are dominated by three species: shoal grass (*Halodule wrightii*), turtle grass (*Thalassia testudinum*), and manatee grass (*Syringodium filiforme*). Widgeon grass (*Ruppia maritima*) is a fresh water species that extends into the upper bays of the coast. It is not considered a true seagrass. Shoal grass occupies the shallow water zones and extends into the intertidal areas. It is the most tolerant of varying conditions and tolerates lower salinities and longer periods of exposure to the air than the other seagrasses. Therefore, it occupies the most extensive range. Shoal grass is the pioneer plant species in areas which have been denuded, thereby stabilizing the area for the colonization by turtle grass. Turtle grass is the most abundant species in terms of biomass. It will out-compete shoal grass in areas where the conditions are suitable. Turtle grass requires continually submerged areas for survival and can grow to relatively deep depths. Manatee grass is most often seen growing with turtle grass and occupies the same habitat as turtle grass (Humm, 1973). Grassbeds in the assessment area are located primarily in the outer bays and behind the barrier islands.

Marshes are the dominant coastal habitat in the area. The three marsh types, salt, brackish, and fresh, are identified by vegetation and salinity. Generally, moving inland from the coast, salinities decrease; and marshes grade from salt through brackish to fresh regimes. Species composition of the marsh depends upon salinity; elevation, which effects the duration of inundation; and soil chemistry.

Of the three marsh types, the salt marsh has the lowest plant species diversity. Four species predominate in the salt marshes of the Gulf: smooth cordgrass (*Spartina alterniflora*), black needlerush (*Juncus roemerianus*), saltmeadow cordgrass (*S. patens*), and salt grass (*Distichlis spicata*). Smooth cordgrass is the dominant marsh species. It is the most seaward of the emergent vegetation and grows in the submerged littoral and intertidal zones where it withstands the deepest and longest inundation. Dense, nearly pure stands of black needlerush are common on slightly higher ground shoreward of smooth cordgrass. A third zone, inundated only at high tides, is vegetated with saltmeadow cordgrass and salt grass.

The brackish marsh is located inland from the tidal marshes. Due to the transitional nature of the brackish marsh, it supports a community of organisms which includes both marine and freshwater species. The dominant species of the brackish marsh are saltmeadow cordgrass, smooth cordgrass, threesquare (*Scirpus* sp.), and salt grass.

Table III-4

Coastal Habitats of the Assessment Area by Acre

County/Parish	Forested Wetlands	Nonforested Wetlands	Seagrass Open	Seagrass Enclosed	Mangroves**
Louisiana					
St. Tammany	122,265	57,057	-	-	-
Orleans	6,669	58,292	-	-	-
St. Bernard	4,199	260,826	-	-	-
Plaquemines	12,844	436,931	-	-	1,000
Jefferson	26,429	81,263	-	-	500
LaFourche	122,512	354,915	2,326	-	2,000
Terrebonne	10,155	555,455	9,664	-	4,000
St. Mary	103,246	131,645	2,235	-	500
Iberia	80,275	122,759	-	-	-
Vermilion	28,405	268,242	-	-	-
Cameron	1,729	841,282	-	-	-
Texas					
Jefferson	2,590*	136,728*	-	-	-
Chambers	4,586	97,748	-	3,101	-
Galveston	-	68,310	1,596	4,787	-
Brazoria	741	94,760	-	3,018	-
Matagorda	3,558	61,480	-	8,579	-
Calhoun	26,341	31,946	-	3,669	-
Aransas	33,932	20,114	-	2,586	-
San Patricio	1,374	20,450	-	-	-
Nueces	217	21,597	-	28,266	-
Kleberg	-	36,838*	-	34,666	-
Kenedy	79	116,109	-	39,525	-
Willacy	-	43,224	-	49,804	-
Cameron	-	125,905	-	109,817	-
TOTALS	592,146	4,043,876	15,821	287,818	8,000

* Only partial figures available.
** No attempt was made to quantify mangroves in Texas since they are so variable.

Sources: USDI, MMS, 1983a and b; 1984b.

Following the trend from the brackish marsh, the freshwater marsh has the highest species diversity. Common species are maidencane (Panicum hemitomon), bullrush (Scirpus spp.), cattail (Typha latifolia), bulltongue (Sagittaria spp.), and saw grass (Cladium jamaicense). Most of the Louisiana coast is vegetated with marsh.

Forested wetlands are located along the coastal area inland from the marshes. The forested wetlands consist mainly of cypress-tupelogum swamps and bottomland hardwoods. Cypress-tupelogum swamps (Taxodium distichum and Nyssa aquatica) are frequently inundated. Bottomland hardwoods are the most diverse of the coastal habitats. Representative species are live oak (Quercus virginiana), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and hackberry (Celtis laevigata).

Beaches - Sandy beaches, including the barrier island systems, border much of the area's coast. Landward of the high energy beaches, extensive dune systems are often built up. The dunes are vegetated with various salt and wind tolerant species such as sea oats (Uniola paniculata), sea ox-eye (Borrichia frutescens), glasswort (Salicornia sp.), salt grass (Distichlis spp.), and scrub live oak (Quercus virginiana). Plant production is limited by the availability of nutrients and freshwater. These plants help to stabilize the beach dunes in two ways. The plants interrupt the air flow and cause windblown particles to deposit, and the roots secure the sand by binding the loose grains together (USDI, MMS, 1983c).

Further inland from mainland beaches, woodland community members, such as several species of pine and oak, predominate. The interior of barrier islands varies from being entirely covered by dunes and grassland in the case of the narrower islands to well-defined zones comprised of forests, sloughs, and wetlands between old dune ridges. On the landward side of barrier islands and beaches, bands of salt marsh are found (USDI, MMS, 1984b).

Where sandy, firmer substrates surround barrier islands, seagrasses and benthic algae occur. These habitats provide refuge and feeding areas for many marine vertebrate and invertebrate species and figure prominently in the overall productively of the waters surrounding barrier islands (Ibid).

Beaches provide habitat in the form of nesting, feeding, and resting areas for many species of waterfowl, shorebirds, and seabirds, as well as stop-over areas for migratory bird species. Additionally, the Gulf beaches provide sea turtles with nesting habitat (Ibid). Perhaps the most important function of the barrier beach and dune environment, when it is allowed to shift with seasonal and storm influences, is to absorb much of the natural energy from wind and wave action, thereby protecting onshore land from excessive erosion and storm damage. Barrier islands also serve to protect the fragile estuarine environment, to control the flow of water between the Gulf and inland open water, and as refuge for various species of wildlife.

Natural beaches and barrier islands are located bordering Gulf waters on most of the Texas coast. In addition, islands are found off of the Louisiana delta.

2. Offshore Habitats

a. Pelagic Environment

The pelagic environment consists of phytoplankton, zooplankton, and nekton. The plankton include all those species in the water column whose general movement geographically is controlled more by the currents than by their own swimming ability (as opposed to the nekton, which includes the fish and squids).

Phytoplankton - Phytoplankton are important as the primary producers of the marine environment. As such they are the starting point in the marine food web, providing food for zooplankton, which in turn provide food for larger marine carnivores. Man, as a harvestor of a variety of marine fish and shellfish, is one of several animals at the "top" of the food web. In addition, phytoplankton play a significant role in the world's oxygen-carbon dioxide budget and, in ways as yet incompletely understood, also serve to detoxify (biodegrade) many pollutants found in the Gulf.

Unfortunately, it is impossible to generalize regarding the distribution of phytoplankton in the Gulf of Mexico. It is clear from the data that have been collected to date that concentrations of phytoplankton are distributed in patches of various sizes which move with the prevailing winds and currents. Other factors, poorly understood, affect the size and distribution of the patches, including availability of nutrients and grazing pressure; therefore, predictions regarding specific locations of a patch or species at any given time simply cannot be made (USDI, MMS, 1983b).

Phytoplankton sampling in the northern Gulf of Mexico has been sparse, intermittent, and most unquantitative. The studies which have been made pertain only to the presence of certain species in given areas. Offshore abundance levels of phytoplankton were greatest during June through August and lowest during the months of October through March. At the inshore stations the periods of greatest abundance were during October through March, while the periods of lesser abundance were during May through September (Ibid).

Zooplankton - Zooplankton comprise a major link between producers (phytoplankton) and higher trophic levels in the water column. The most abundant zooplankton are the copepods. Other significant members of the zooplankton are chaetognaths, crustaceans, ctenaphores, medusae of various species, molluscs, pyrosomes, and a variety of larvae from several phyla (Ibid).

In general, as with the phytoplankton, zooplanktonic species diversity decreases with the decreased salinity; and biomass decreases with distance from the estuary. Also as with the phytoplankton, it is impossible to generalize about specific location and extent of concentrations of zooplankton due to the extreme patchiness of the phytoplankton on which many zooplankters feed (Ibid).

Nekton - Nekton in the AEA area includes fishes, marine mammals, reptiles (turtles), cephalopod molluscs, and certain swimming crustaceans, such as shrimps and crabs. The most conspicuous forms are the fishes, reptiles, and mammals. The fishes of commercial and recreational importance to the AEA area are discussed in Sections III.C.7. and III.C.8. The marine turtles are discussed in the Endangered Species section, III.B.3.

b. Benthic Environment

The benthos is composed of those plants and animals which live in, on, or in close association with the substrate. Benthic fauna include the infauna (animals which live in the substrate such as burrowing worms and molluscs) and epifauna (animals that live on the substrate such as molluscs, crustaceans, hydroids, sponges, and echinoderms). Shrimp and demersal fish are closely associated with the benthic community (USDI, MMS, 1983b).

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The distribution of benthic fauna correlates with physical factors (Defenbaugh, 1976). Substrate is the single most important factor. Temperature and salinity are also important in determining the extent of faunal distribution. Other lesser important factors include illumination, exposure to air, nutrient availability, currents, tides, and wave shock. Defenbaugh (Ibid) states that depth and/or distance from shore should also be considered as major influences on the bethic faunal distribution.

The benthos of the East and West Flower Garden Banks is discussed in Section III.B.2.c. Defenbaugh (Ibid) classified the area surrounding the Banks as Upper Slope Assemblage, Texas-Louisiana Shelf. Characteristic species of the assemblage are listed in his dissertation. This assemblage is relatively deep and occurs at the bottom of the turbid nephloid layer.

c. Sensitive Underwater Features

Flower Garden Banks

The AEA area is composed of the blocks which lie within the four mile zone of the East and West Flower Garden Banks. The Flower Gardens are two of the numerous shelf edge banks in the northern Gulf of Mexico. Coffee Lump and MacNeil Bank are the closest banks to the AEA area (Figure A). The Flower Gardens are unique in that they are capped by the northern most thriving tropical coral reefs on the eastern coast of North America. Comparatively, the Flower Gardens are depauperate in hermatypic corals, containing only 33% of the known Caribbean species. The existance of thriving coral communities on the Flower Gardens is due to the environmental conditions which exist at their location. Each of the temperature, transmissivity, salinity, and water depth parameters are such that coral growth is permitted. This combination of parameters is not met at any other place in the northern Gulf. The diversity of the reef related biota is not yet known. The following numbers of species have been reported: 30 species of benthic algae at the East Flower Gardens and 253 species of invertebrates and 103 fish species at the West Flower Gardens (Rezak et al., 1983).

Both Banks exhibit nearly identical depth-related biotic zonation. The biotic zonation of the two Banks is shown in Figures III-8 and III-9. Figure III-10 generally depicts the biotic zonation of the Banks in relationship to depth (Ibid).

The Flower Garden Banks are capped by coral reefs made up of closely spaced coral heads up to 3m (10 ft) in diameter. The reef heads extend from the shallowest portions of the Banks, 11m (36 ft) at the shallowest, to 52m (171 ft) in places. The coral reefs are characterized by two biotic zones, a high diversity and a low diversity assemblage (Ibid).

The high diversity assemblage is named the *Diploria-Montastrea-Porities* Zone. This zone is characterized by 18 hermatypic coral species. The dominant species of the zone in order of dominance are *Montastrea annularis*, *Diploria strigosa*, *M. cavernosa*, *Colpophyllia* spp., and *Porites asteroides*. The biotic zone was named before the order of dominance was known; therefore, the name does not reflect the true order of dominance. This zone occupies water depths less than 36m (118 ft). Much is known of the *Diploria-Montastrea-Porites* Zone since it is accessible by SCUBA (Ibid).

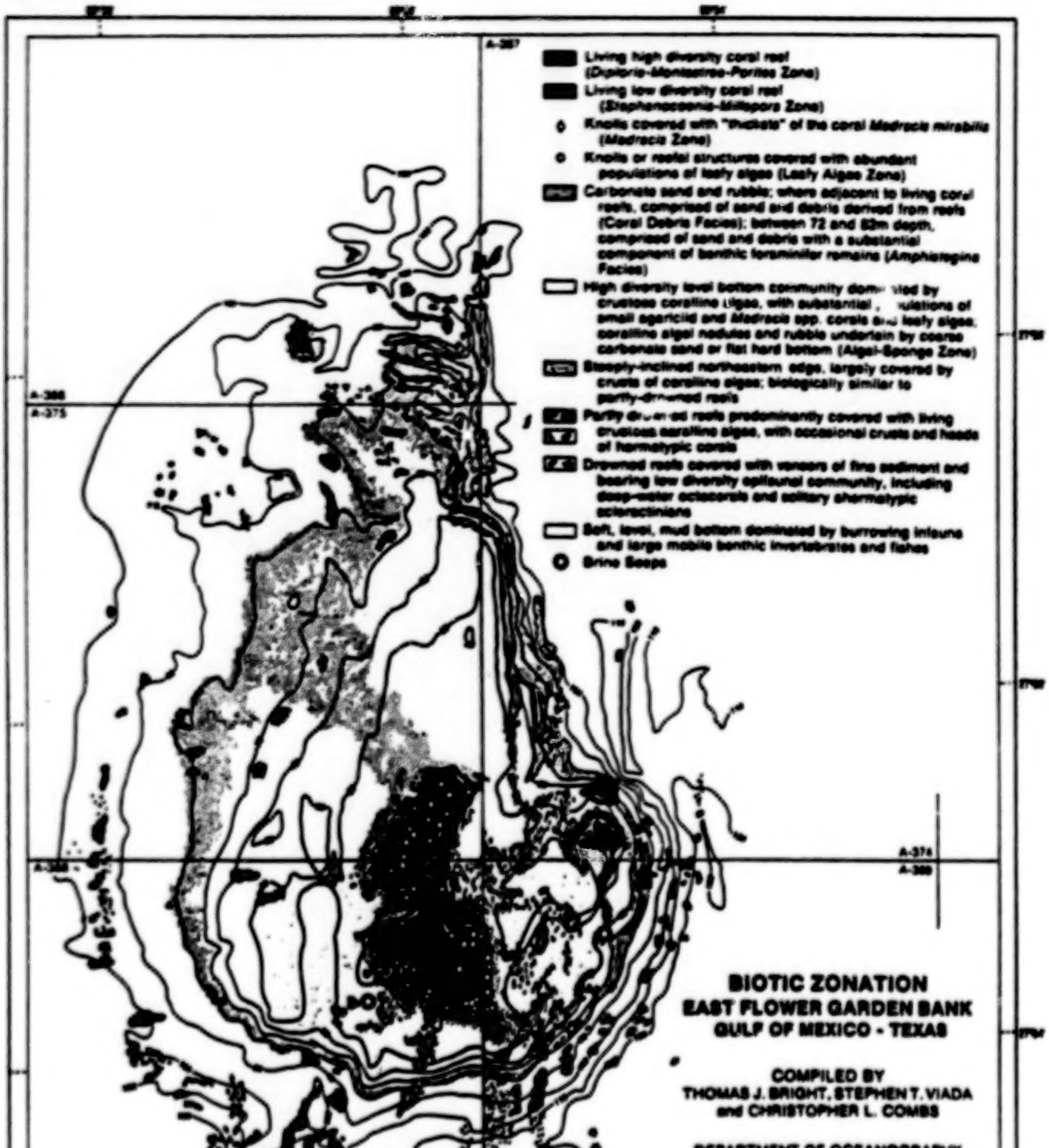
A-387
Living high diversity coral reef (Diploria-Montastrea-Porites Zone)
Living low diversity coral reef (Stephanocoenia-Millepora Zone)
Knolls covered with "thickets" of the coral Madracis mirabilis (Madracis Zone)
Knolls or reefal structures covered with abundant populations of leafy algae (Leafy Algae Zone)
Carbonate sand and rubble; where adjacent to living coral reefs, comprised of sand and debris derived from reefs (Coral Debris Facies); between 72 and 82m depth, comprised of sand and debris with a substantial component of benthic foraminifer remains (Amphistegina Facies)
High diversity level bottom community dominated by crustose coralline algae, with substantial populations of small agariciid and Madracis spp. corals and leafy algae; coralline algal nodules and rubble underlain by coarse carbonate sand or flat hard bottom (Algal-Sponge Zone)
Steeply-inclined northeastern edge, largely covered by crusts of coralline algae; biologically similar to partly-drowned reefs
Partly drowned reefs predominantly covered with living crustose coralline algae, with occasional crusts and heads of hermatypic corals
Drowned reefs covered with veneers of fine sediment and bearing low diversity epifaunal community, including deep-water octocorals and solitary ahermatypic scleractinians
Soft, level, mud bottom dominated by burrowing infauna and large mobile benthic invertebrates and fishes
Brine Seeps
A-375
A-374
BIOTIC ZONATION
EAST FLOWER GARDEN BANK
GULF OF MEXICO - TEXAS
COMPILED BY
THOMAS J. BRIGHT, STEPHEN T. VIADA
and CHRISTOPHER L. COMBS
DEPARTMENT OF OCEANOGRAPHY
TEXAS A&M UNIVERSITY
1981
CONTOUR INTERVAL: 10 METRES
DATUM: SEA LEVEL
METRES

Figure III-8 Biotic Zonation of the East Flower Garden Bank
Source: Rezak et al., 1983.

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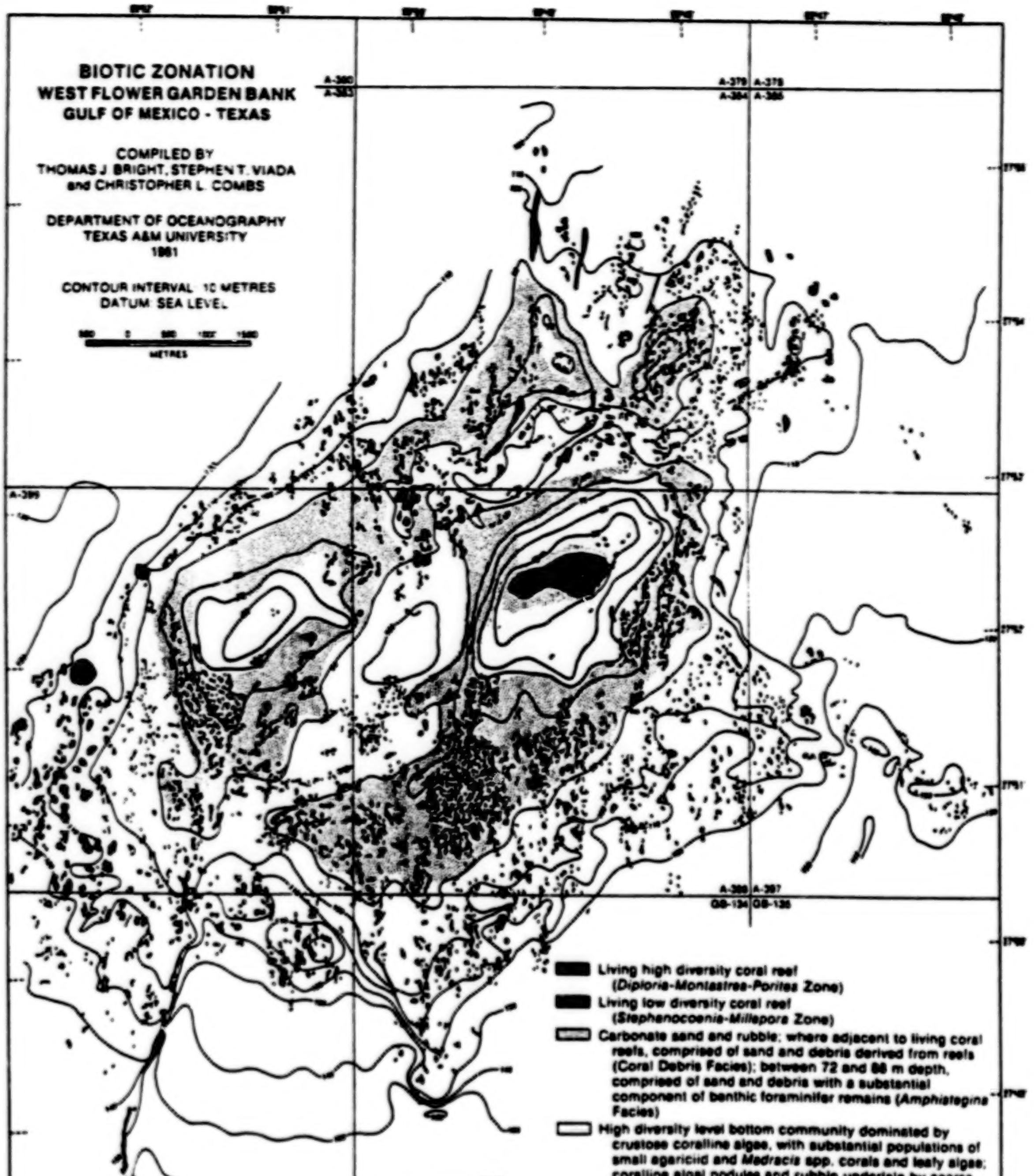
BIOTIC ZONATION
WEST FLOWER GARDEN BANK
GULF OF MEXICO - TEXAS
COMPILED BY
THOMAS J. BRIGHT, STEPHEN T. VIADA
and CHRISTOPHER L. COMBS
DEPARTMENT OF OCEANOGRAPHY
TEXAS A&M UNIVERSITY
1981
CONTOUR INTERVAL 10 METRES
DATUM SEA LEVEL
METRES
A-380
A-379
A-378
A-399
A-397
GB-134
GB-135
A-401
GB-178
Living high diversity coral reef (Diploria-Montastrea-Porites Zone)
Living low diversity coral reef (Stephanocoenia-Millepora Zone)
Carbonate sand and rubble; where adjacent to living coral reefs, comprised of sand and debris derived from reefs (Coral Debris Facies); between 72 and 88 m depth, comprised of sand and debris with a substantial component of benthic foraminifer remains (Amphistegina Facies)
High diversity level bottom community dominated by crustose coralline algae, with substantial populations of small agariciid and Madracis spp. corals and leafy algae; coralline algal nodules and rubble underlain by coarse carbonate sand or flat hard bottom (Algal-Sponge Zone)
Partly drowned reefs predominantly covered with living crustose coralline algae, with occasional crusts and heads of hermatypic corals
Drowned reefs covered with veneers of fine sediment and bearing low diversity epifaunal community, including deep-water octocorals and solitary ahermatypic scleractinians
Soft, level, mud bottom dominated by burrowing infauna and large mobile benthic invertebrates and fishes

Figure III-9 Biotic Zonation of the West Flower Garden Bank
Source: Rezak et al., 1983.

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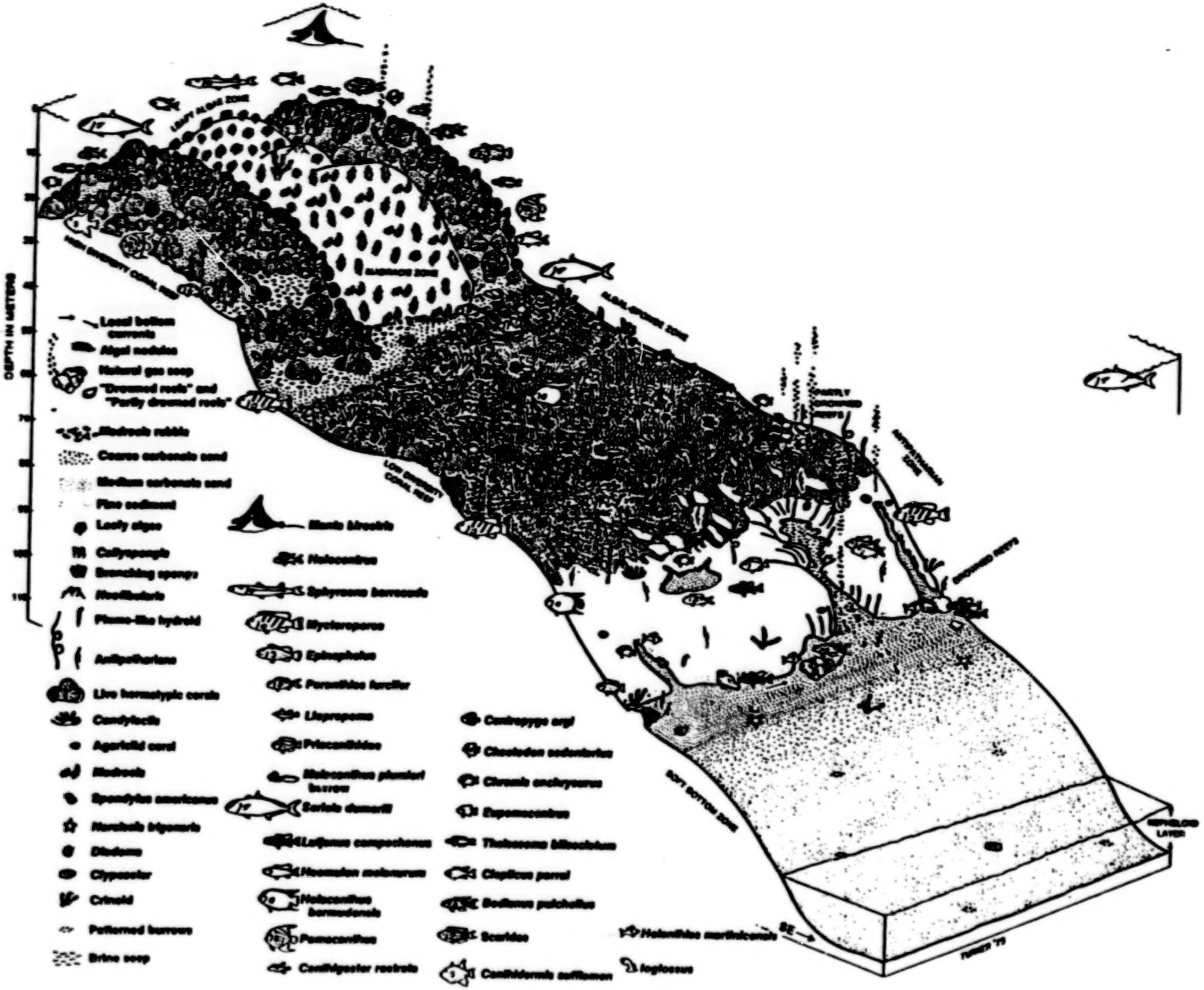

Figure III-10 Depiction of Biotic Zonation of the Flower Garden Banks
Source: Rezak et al., 1983.

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Coralline algae are abundant in the *Diploria-Montastrea-Porites* Zones, adding substantial amounts of calcium carbonate to the substrate. Leafy algae are sparce probably due to grazing. All of the 253 species of reef invertebrates reported for the West Bank are found in the *Diploria-Montastrea-Porites* Zone as are the 103 species of reef fish. Typical sport and commercial fish which frequent the *Diploria-Montastrea-Porites* Zone include: groupers, hinds, amberjacks, barracuda, red and vermilion snapper, cottonwick, porgys, and creole fish (Ibid).

Below the *Diploria* Zone, to generally 46m (151 ft) and to 52m (171 ft) depth at the deepest, the *Stephanocoenia-Millepora* Zone exists. The *Stephanocoenia-Millepora* Zone is inhabited by a low diversity coral assemblage of 12 hermatypic corals. The eight most conspicuous corals in order of dominance are *Stephanocoenia* *michelinii*, *Millepora* sp., *Montastria* *cavernosa*, *Colpophyllia* spp., *Diploria* sp., *Agaricia* spp., *Mussa* *angulosa*, and *Scolymia* sp. (Ibid).

The assemblages associated with the *Stephanocoenia-Millepora* Zone are not well known. Coralline algae are more conspicuous in this zone. Reef fish populations are less diverse. The American thorny oyster (Spondylus *americanus*) appears numerous in the zone (Ibid).

At the East Flower Garden Bank at 26-46m (85-151 ft) depth, large knolls which lack massive coral heads occur. Some of these knolls are inhabited by the small branching coral, *Madracis* *mirabilis*, and/or lush assemblages of leafy algae. The *Madracis* Zone appears to have a successional relationship with the *Diploria-Montastrea-Porites* Zone. The *Madracis* remains build up the substrate and allow the successional species to grow (Ibid).

The Algal-Sponge Zone occurs from 46-82m (151-269 ft) at the East Flower Garden and to 88m (289 ft) at the West Flower Garden. The dominant organisms of the Zone are the coralline algae. The coralline algae are the most important carbonate nodule producers. The algae nodules range from 1-10cm in size and cover 50% to 80% of the bottom (Ibid).

The algae nodules create a habitat which supports communities which are probably as diverse as the coral reef communities. Most of the leafy algae found on the Banks occurs in this Zone. The leafy algae contribute large amounts of food to the surrounding communities. In addition to the coralline algae, calcareous green algae (Halimeda and Udotea) and several species of hermatypic corals are major contributors to the subtrate. Deep water alcyonarians are abundant in the lower Algal-Sponge Zone. Sponges, especially *Neofibularia* *nolitangere*, are conspicuous. Echinoderms are abundant and also add to the carbonate substrate. Small gastropods and pelecypods are also abundant. Gastropod shells are known to form the center of some of the algal nodules. Characteristic fish of the Algal-Sponge Zone are yellowtail reeffish, sand tilefish, cherubfish, and orangeback bass (Ibid).

Partly drowned reefs are a major biotope of the Algal Sponge Zone. They are defined as those reefal structures covered with living crusts of coralline algae with occasional heads of hermatypic corals. In addition to the organisms typical to the rest of the Algal-Sponge Zone, the partly drowned reefs are also inhabited by large anemones, large comatulid crinoids, basket stars, limited crusts of *Millepora*, and infrequently small colonies of other hermatypic species (Ibid).

The transitional Antipatharian Zone occurs at 52-90m (171-295 ft) water depth. This transitional zone is not distinct but blends in with the lower Algal-Sponge Zone. It is characterized by an abundance of antipatharian whips growing with the Algal-Sponge assemblage. Over 80m (263 ft) water depth, the assemblages of the Zone become less diverse, characterized by antipatharians, comatulid crinoids, few leafy or coralline algae, and limited fish (Holanthias martinicensis, H. bermudensis, Bodianus pulchellus, Chromis enchrysurus) (Ibid).

Drowned reefs occur deeper than 82m (269 ft) at the East Flower Gardens and below 88m (289 ft) at the West Flower Gardens. Drowned reefs are reefal structures which are now too deep for hermatypic corals to exist and where there are few coralline algae populations. The most noticable attached fauna are comatulid crinoids, octocoral whips and fans, antipatharians, encrusting sponges, and solitary ahermatypic corals. The fish fauna of the drowned reefs are different and less diverse than the coral reefs or partly drowned reefs. These fish species include red snapper, spanish flag, snowy grouper, bank butterflyfish, scorpionfishes, and roughtongue bass. All of these species except the red snapper are commonly found only on the drowned reefs. Red snapper congregate around reefal structures at all depths but prefer deeper areas. The drowned reefs at the Flower Gardens are found at a depth where turbidity is high and light penetration is low. Most of the structures are covered with a veneer of fine sediment. Organisms from the Algal Sponge Zones and partly drowned reefs would probably occupy these depths if it were not for these parameters (Ibid).

MacNeil Bank

A portion of MacNeil Bank is situated in the northeast portion of the AEA Area (Figure A). MacNeil Bank has not been biologically characterized; however, the assemblages associated with the Bank can be deduced by comparing the Bank to other shelf edge banks. MacNeil Bank crests at about 62m (203 ft). Surrounding water depths are about 86-94m (282-308 ft) (Oceanonics, 1980). Studies on the extent of the nephloid layers at various banks have shown that the turbid nephloid layer varies in thickness but generally does not extend above 20m (66 ft) from the seafloor (Rezak et al., 1983). The 24-32m (79-105 ft) relief of MacNeil Bank should therefore allow growth of the assemblages which occur at the corresponding depth zones at the Flower Garden Banks. MacNeil Bank is probably characterized by Algal Sponge Zone assemblages and by deeper Antipatharian Zone and drowned reef communities.

Coffee Lump

Coffee Lump is located to the north of the AEA area at the eastern side (Figure A). Coffee Lump crests at 62m (203 ft); however, its relief is rarely greater than 3m (10 ft). These conditions make it likely that Coffee Lump is completely enveloped by the nephloid layer most of the time. The Algal-Sponge Zone assemblages do not therefore occur at Coffee Lump. Coffee Lump is characterized by the Antipatharian Zone. On the soft bottom areas of the Bank, there is a predominance of antipatharian whips, comatulid crinoids, large asteroids, small benthic fishes, and a large population of small crustaceans. The hard bottom biota is dominated by antipatharian whips, comatulid crinoids, coralline algae, sponges, large hydroids, and serpulid worms (Rezak et al., 1981).

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3. Endangered or Threatened Species

A number of Federally designated endangered and threatened species occur, either on a permanent or transitional basis, within this AEA coastal and offshore area. The general location of these species is shown in Visual No. 3 of the EIS for Sales 81 and 84 (USDI, MMS, 1983a).

The American alligator occurs generally throughout the AEA coastal areas in fresh to brackish water wetlands. The largest alligator population in the Gulf occurs in Louisiana, approximately 200,000 individuals. The largest alligator populations in Texas occur in the southeastern coastal counties next to Louisiana (Ibid).

Three endangered marine turtle species (Kemp's ridley, hawksbill, and leatherback) and two threatened species (loggerhead and green) occur in the central and western Gulf of Mexico. Only the loggerhead is sighted frequently in the Gulf. The loggerhead has historically nested in the Chandeleur Islands, Louisiana area. Nesting occurs from April to August with peak nesting in June. The Kemp's ridley turtles have historically nested on Padre Island, Texas. They inhabit shallow coastal and estuarine waters. The hawksbill turtle generally inhabits reefs, shallow coastal areas, and passes in water less than 20m (66 ft) deep. The leatherback turtle is the most pelagic marine turtle and may be found near the continental shelf edge. Sightings have been reported along the Gulf coast in March and April. The favored habitats of the green turtle are lagoons and shoals providing an abundance of marine grass and algae. Currently, none of the marine turtles frequent the AEA coastal beaches for nesting (Ibid).

Several endangered or threatened bird species occur in the AEA coastal area. Arctic peregrine falcons migrate through and some may overwinter along the southwestern Texas coastal area and central Gulf. The migratory whooping crane overwinters at the Aransas National Wildlife Refuge and surrounding area from October to April.

Four small populations of brown pelicans (about 900-1,000 birds) occur in Rockefeller Refuge, Queen Bess Island, northern part of St. Bernard Parish, and North Islands, Louisiana (USDI, MMS, 1983b). Only the Queen Bess Island and St. Bernard Parish colonies are known as breeding colonies (Appendix). In Texas, colonies of brown pelicans have nested on several islands between Corpus Christi and Aransas NWR in the recent past. These islands are Pelican Island in Corpus Christi Bay, Long Reef in Aransas County, Deadman's Reef north of Rockport, Caroll Island in Second Chain of Islands in San Antonio Bay, and Sundown Island in Matagorda Bay (Appendix and Clapp et al., 1982). In 1983, breeding colonies were only reported on Pelican Island and Second Chain of Islands. An isolated breeding pair was reported at San Bernard NWR in Brazoria County (Meuller, 1984).

Bald eagles feed and nest along the coastal areas of Brazoria-San Patricio Counties, Texas (USDI, MMS, 1983a). Small discrete populations of Attwater's prairie chicken occur in the coastal prairie of the mid-Texas coast. The red cockaded woodpecker occurs in mature open pine forests in eastern Texas and the Central Gulf coastal area (USDI, MMS, 1983b).

Five Federally listed endangered whale species (fin, humpback, right, sei, and sperm whales) occur in the northern Gulf of Mexico. Generally these larger cetaceans occur in the continental slope and deep oceanic waters. Schmidly (1981) documented historic strandings, sightings, and captures of these species. A right whale stranding is reported near Galveston, Texas. A

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sei whale was stranded in coastal Louisiana. Several fin whales stranded in Louisiana and one near Galveston, Texas. The sperm whale has the most documented sightings. Several strandings have occurred in Texas and one in Louisiana. Schmidly (Ibid) reports many sightings and captures of sperm whales in the Gulf waters off of Texas and Louisiana.

Three other endangered mammal species occur in the coastal areas of Texas and Louisiana. The red wolf habitat is located in coastal areas from Vermilion Parish, Louisiana to Galveston County, Texas. Ocelot habitat extends coastal and inland from Kenedy County, Texas, southward. Jagurundi habitat is located in the southern part of Cameron County, Texas (USDI, MMS, 1983a).

4. Breeding Habitats and Migration Routes

The AEA coastal area is used by brown pelicans, bald eagles, and sea turtles, as nesting areas. Further information is given in Section III.B.3. Visual No. 11 of the 81/84 EIS (USDI, MMS, 1983a) gives the locations of these nesting habitats. The estuarine areas are used as nursery areas for species of commercially and recreationally important shellfish and finfish.

The AEA coastal area is also the site of several migration routes. The Mississippi flyway is a major route for many migratory waterfowl which overwinter in the delta and floodplain area. The migration route of the arctic peregrin falcon follows the coastal area of Texas. Winter Critical Habitat for the migratory whooping crane is established in and around the Aransas NWR in Texas where the whoopers overwinter.

No known breeding or nursery grounds or migration routes are found in the AEA offshore area.

5. Protected Areas of Biological Concern

The coastal habitats in the assessment area provide an intricate network of environmental systems which have resulted in diverse management schemes to maximize public utilization without endangering the resources. Systems of classification include wildlife refuges, parks, wilderness areas, national forests, bird sanctuaries, aquatic preserves, recreational beaches, and wild, scenic and recreational waterways. Recreational aspects are discussed in Section III.C.8. This section deals with those areas established in order to conserve biological resources. Table III-5 shows the various coastal biologically sensitive areas by state which have been designated for protection. Refer to Visual 4-II of the Environmental Impact Statement for Sales 81 and 84 for the locations of the areas (USDI, MMS, 1983a).

Management schemes are often established in order to conserve areas of particular environmental concern such as wintering, nursery, or breeding grounds; endangered species critical habitat; or limited and diminishing habitats of ecological importance. For example, the Aransas National Wildlife Refuge contains Critical Habitat for the whooping crane. The endangered brown pelican uses Breton NWR as feeding and nesting habitat. Endangered sea turtles use the area's beaches, such as Padre Island National Seashore for nesting. Section III.B.3. defines the critical habitats of endangered species more completely.

The coastal environments are especially susceptible to developmental pressures. Conservation of these habitats is important in order to preserve their functions as discussed in Section III.B.1. Therefore, many of these sensitive habitats are represented in the established protected areas. Delta NWR is composed of marsh and Breton NWR and Padre Island NS are examples of the conservation of the barrier island habitat.

The Flower Gardens have been proposed for designation as a National Marine Sanctuary. The proposed boundaries are the no activity zones of the East and West Banks. The National Oceanonic and Atmospheric Administration is preparing an Environmental Impact Statement assessing the impacts of the proposal.

Table III-5

Protected Areas of Biological Concern

State	Protected Area
Louisiana	Delta National Wildlife Refuge Breton National Wildlife Refuge and Wilderness Area Shell Keys National Wildlife Refuge Marsh Island Wildlife Area Rainey Wildlife Sanctuary (National Audubon Society Sanctuary) Rockefeller Refuge
Texas	Sea Rim National Wildlife Refuge McFaddin Marsh National Wildlife Refuge Sabal Palm Grove (National Audubon Society Sanctuary) Vingt-et-un Islands (National Audubon Society Sanctuary) Brazoria National Wildlife Refuge San Bernard National Wildlife Refuge West Bay Bird and North Deer Islands (National Audubon Society Sanctuary) Aransas National Wildlife Refuge Robert Porter Allen Sanctuary (National Audubon Society Sanctuary) Matagorda Island (National Audubon Society Sanctuary) Padre Island National Seashore Lydia Ann and Harbor Island (National Audubon Society Sanctuary) Padre Island National Seashore South Bird Island (National Audubon Society Sanctuary) Laguna Acosta National Wildlife Refuge Green Island (National Audubon Society Sanctuary) Three Islands (National Audubon Society Sanctuary)

Source: USDI, MMS, 1983a. Visual 4-II.

C. SOCIOECONOMIC CONDITIONS AND CONCERNS

1. Economic and Demographic Conditions

The onshore counties which would serve as bases of operations for oil and gas activity in the AEA area are those nearshore counties in Texas and Louisiana. The region varies substantially in socioeconomic patterns, ranging from low-density, undeveloped rural areas to high-density, highly developed urban centers. Further specific information is given in the Environmental Impact Statements for GOM OCS Lease Sales (USDI, MMS, 1983a, 1983b, 1984b). The information is updated in each EIS. Referal to future EISs is recommended as they become available. No new employment is expected as a result of activities in the AEA area. If new employment is identified in an operational plan, this section would be discussed in an SEA.

2. Land Use

The AEA coastal area is primarily barrier islands, beaches, and wetlands. In most of the sandy beach areas, recreational activity is occurring and is increasing. Wetlands are not suitable areas for development. Most of the Louisiana coast is wetlands. Industrialized areas, primarily oil and gas related, are therefore located in inland pockets (USDI, MMS, 1983a). Much of the Texas barrier island system is undeveloped and should remain so due to the establishment of the Padre Island National Seashore. Pockets of other industrialized areas are oil and gas related, particularly in port areas (USDI, MMS, 1984b). Refer to the latest GOM OCS EIS for oil and gas lease sales for further information. Should future new or significantly expanded onshore support facilities be proposed in a plan, this section would be discussed in an SEA.

3. Onshore Support Facilities

The infrastructure for oil and gas production in the Gulf of Mexico is the most developed in the world. It includes oil refineries, petrochemical and gas processing plants, supply bases for offshore services, platform construction yards, and other industry-related installations (USDI, MMS, 1983a). Major onshore bases in the AEA coastal area are shown in Figure B. The existing facilities are expected to be adequate for any projected activities which would occur in the AEA area. Should future new or expanded onshore support facilities be proposed in a plan, this section would be discussed in an SEA.

4. Public Opinion

This section will be addressed in the SEA.

5. Navigation

No fairways or anchorage areas are located in the AEA area. The nearest fairway is located adjacent to the AEA offshore area immediately to the south (Figure A). This fairway is traveled significantly by boats using Texas coastal ports (USDC, NOAA, 1979).

6. Military Warning/Use Areas

A portion of Military Warning Area W-602 is located in the southwestern portion of the AEA area. Military operations within warning areas in the Gulf include carrier maneuvers, missile testing, rocket firing, pilot training, air-to-air gunnery, air-to-surface gunnery, minesweeping operations, submarine operations, air combat maneuvers, aerobatic training, and instrument training (USDI, MMS, 1983b). The portion of W-602 within the AEA area is shown in Figure A.

7. Commercial Fishing

The AEA area is located seaward of major high productivity areas for most commercial fisheries (USDI, MMS, 1983a). An extensive royal red shrimp ground exists along the continental slope (about 9-38km, 5-20 mi, south of the Banks), (USDI, MMS, 1983a and USDC, NOAA, 1979). The Flower Garden Banks are located within the boundary of a major finfish area (USDI, MMS, 1983a). Major commercial finfish landed in Texas and Louisiana are red and black drum, red snapper, flounder, and spotted sea trout. However, several of these species are coastal and would not be abundant at the AEA area (USDI, MMS, 1983b and 1984b). At the Banks themselves, commercial fishing for red and vermilion snappers, groupers, and other unspecified finfish has occurred since the 1880's. Currently commercial fishing is limited to snappers. Most of the fishing occurs around the coral cap in about 30-50m (100-165 ft) of water using hand lines. Commercial fishing for groupers, jewfish, and tuna (bluefin, yellowfin, blackfin, and skipjack) could possibly be supported near the Banks (USDC, NOAA, 1979).

8. Recreation

The coastlines of Louisiana and Texas adjacent to the Flower Garden Banks area offer a variety of recreational resources and activities, particularly in connection with marine fishing and beach-related activities. The Flower Garden Banks are favored destinations for sport fishermen and divers (Figure B). Refer to the FREIS for a discussion of the recreational resources available in the AEA coastal area. Visual No. 4-II for the EIS for Sales 81 and 84 depicts and identifies most of the designated park and recreational areas beyond the urban centers that exist within the AEA coastal zone (USDI, MMS, 1983a).

Resources/Tourism - The Louisiana Deltaic Plain adjacent to the assessment area is characterized by extensive tracts of marsh, and therefore, supports recreational pursuits centering around hunting and fishing. However, Louisiana's tourism, based on the unique natural environments and renewable resources of its coastal wetlands, appears to be underdeveloped due to the lack of on site improvements facilitating public use (Larson et al., 1980). Data from the U.S. Data Center indicated that travel expenditures in the Louisiana Gulf Region amounted to over $2.7 billion in 1982. Over 67% of the study region's travel expenditures occur in Orleans Parish. Correspondingly, recreational attractions such as a variety of sports events, festivals, conventions, and sightseeing activities account for the majority of tourism in the Louisiana Gulf Region (USDI, MMS, 1984b).

Sandy white beaches are a major source of tourist attraction for the coastal area of the State of Texas. Therefore, a large percentage of the recreational activity in the Texas coastal area is beach oriented.

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Approximately 25.7% or 87.1km (140.2 mi) of the Texas coast is designated as a major recreational shorefront beach (USDI, MMS, 1983a, Visual No. 14). According to data from the Texas Tourist Development Agency, total travel expenditures in the Texas Gulf region were about $4.7 billion in 1982, or 34.2% of the comparable State total. About 91% of the Texas Gulf region's travel expenditures occurred in major metropolitan areas that are in close proximity to popular Texas Gulf beaches, specifically in Cameron, Galveston, Harris, Jefferson, and Nueces Counties (USDI, MMS, 1984b). Fishing, swimming, picnicking, and boating are consistently the more popular recreational activities (Liebow et al., 1980).

The principal recreational attractions of the Flower Garden Banks are the regionally unique coral reefs which cap the Bank peaks and the diversity of the fish. These reefs attract both recreational scuba divers (who engage in activities including underwater photography, nature study, spear-fishing, and souvenir collecting) and hook and line sports fishermen (USDC, NOAA, 1979). Due to the distance of the Flower Garden Banks from shore [203km (110nm)] and the numerous artificial reefs available for fishing further inland, it is more likely that the majority of visitors to the Flower Garden Banks would be divers. The Banks' unique and varied biota has in the past and should continue in the future to attract scuba divers from the nearby coastal region. Peak recreational use periods are July, August, and September, when weather conditions are favorable and leisure time is greatest. Recreational use of the East Flower Garden Bank is considerably heavier than the West Flower Garden Bank due to its shallower depth (Ibid).

Boating - Along the Gulf coast, boating is a popular weekend and seasonal sport. Access to the open Gulf for recreational purposes (saltwater fishing, scuba diving) requires a boat; therefore, some portion of coastal boaters venture into the open Gulf in their private vessels. The number of private boat owners who use their craft recreationally in the Gulf is not precisely known; however, former studies and estimates by U.S. Coast Guard and others indicate that approximately 5-10% of the registered motor boats in the Gulf coastal states venture out into the Gulf (USDI, MMS, 1983b).

The distance from shore [203km (110 nm)] does preclude recreational use of the Flower Garden Banks somewhat. Only the most experienced private recreational boat operators attempt the 6-8 hour (one way) trip to reach the Banks. Due to the length of the trip, most of these boats anchor overnight. Commercial charter boat service carrying recreational divers to the Flower Garden Banks is available from numerous ports along the adjacent coastal area. Because the commercial charter boats are slower than private vessels (12 hours each way), these boats typically anchor overnight (USDC, NOAA, 1979). The demand for charter boat service to the Flower Garden Banks is projected to grow along with the increased interest shown in scuba diving as a sport.

Sport fishing - Marine recreational fishing is an important and very popular activity for residents and tourists in the AEA coastal states. The demand for saltwater fishing in the coastal zone and offshore is projected to grow along with population and tourist growth. As an outgrowth of the significant demand for saltwater fishing, especially from tourists, a large charter and head boat fishery has developed over the years (USDI, MMS, 1983b). Table III-6 shows the numbers available and the base locations for the major charter and head boats in the AEA coastal area. King mackerel, cobia, sailfish, tarpon, marlin and red snapper are the most sought after offshore game fishes. Inshore saltwater game fishes of note include the

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spotted sea trout, red drum, southern flounder, and Atlantic croaker (Liebow et al., 1980). The Gulf of Mexico Fishery Management Council, for all Gulf States, estimated in 1981, that groupers, jacks, porgies, and snappers made up 93% of the number of fish caught and 99% of the weight (French et al., 1983). Natural and artificial reefs are the focus of most offshore recreational fishing. Visual No. 4-II of the EIS for Sales 81 and 84 lists those artificial reefs along the coastal area adjacent to the AEA area (USDI, MMS, 1983a). Most of the recreational fishing activity at Flower Garden Banks is centered around the fringes of the coral reef. Snapper are most sought in that Zone. Further from the center of the reefs, in deeper fringing waters, billfish (marlin, sailfish, swordfish) are fished for by tournament and sport fishing boats (USDC, NOAA, 1979).

Table III-6

AEA Coastal Area Charterboat/Headboat Fleet

State*	Number of Charterboats	Number of Headboats	Port Vicinity
Louisiana	29	1	Empire, Buras, Grand Isle, Venice, Cocodrie, Hopedale
Texas	99	31	Port Isabel, South Padre Island, Port Mansfield, Aransas, Corpus Christi, Galveston, Freeport

* Includes only those portions of these States which are adjacent to the AEA area.

Source: USDI, MMS, 1983a, Visual No. 4-II.

9. Cultural Resources

The AEA area lies outside of both the Prehistoric and Historic Cultural Resources High Probability Lines. These lines are a reflection of "high probability" limits based on a zonation map developed as a synthesis of the known archaeological record for the entire Gulf Coast, an interpretation of possible prehistoric settlement patterns based on the geomorphology of the Outer Continental Shelf, and data in the occurrence of known historic shipwrecks in the northern Gulf of Mexico from 1500 A.D. through 1945 A.D. Based on the study by Coastal Environments, Inc. (1977), Cultural Resource Surveys for activities within the AEA area are not required. No shipwrecks are known within or adjacent to the AEA area. No evidence of known cultural resources exist within or adjacent to the AEA area. Should evidence of cultural resources be discovered offshore or during any onshore facility construction, this section will be supplemented in an SEA.

10. Other Commercial Uses

There are no other known commercial uses in the area.

11. Other Mineral Uses

The Secretary of the Interior is authorized under the Outer Continental Shelf Lands Act, 54 USC 1331 et seq., to issue leases for minerals other than oil, gas, and sulfur on the OCS, and under the provisions of the Mining and Minerals Policy Act of 1970, 30 USC 21a, to foster and encourage private enterprise in mining or mineral activities.

A variety of mineral commodities occurs as surficial or near surficial deposits on the GOM OCS. Sulphur and salt deposits associated with the sands of diapiric and domes structures on the GOM OCS seafloor have mining potential. There are no manganese nodule deposits in the Gulf of Mexico.

In order for development to proceed, impact assessment of the proposed oil and gas leasing program on future mineral GOM OCS mining is dependent upon many prerequisites, the most important of which are discovery and evaluation followed by technological advances and a supportive economic climate. At present, there are no further plans or proposals for the mining of minerals from the Gulf of Mexico OCS seafloor. This activity is in the distant future until the above-mentioned prerequisites are conducive to offshore mining.

12. Pipelines and Cables

There are three existing pipelines in the AEA area. Two originate from Platform A in High Island Block A-376. A Trunkline 10-inch gas pipeline (G 5238) ties-in to a 12-inch line in High Island Block A-356. A Tesoro-Questor 6-inch oil line (G 5940) ties-in to a 10-inch line in Block A-546. A Michigan-Wisconsin 12-inch gas pipeline (G 5266) originates at Platform A in High Island Block A-368 and ties-in to an existing pipeline in High Island Block A-370. (See Figure A for locations of these lines.)

There are no cables in the AEA area.

13. Ocean Dumping

All ocean dumping is regulated by the Marine Protection, Research, and Sanctuaries Act of 1972, 33 USC 1401 et seq. These regulations require a USEPA permit for all ocean dumping of industrial wastes and municipal sludge materials. Ocean dumping of sewage sludge is prohibited. The designated ocean areas where wastes may be disposed are listed in 40 CFR 228. Further, USEPA publishes an annual report entitled Ocean Dumping in the United States. This report includes information on permit holders, type of waste approved for disposal under the permit, and yearly waste volumes disposed.

USEPA has designated one large deepwater disposal area in the Gulf of Mexico. This dumping area is located approximately 89km (55 mi) south of the AEA area (Figure B). This site is an incineration site for the burning of liquid chemical wastes.

An Army Corps of Engineers permit is required for ocean disposal of dredged material. Conflicts may arise between GOM OCS oil and gas operations and COE permitted activities. At the time of this writing, no formal coordination between Minerals Management Service and COE has taken place.

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IV. ENVIRONMENTAL CONSEQUENCES

This section of the AEA discusses the impacts of exploration and production activity to and/or from the various environmental parameters discussed in Section III. Impacts resulting from pipeline installations are not discussed in the AEA. The Regional Environmental Assessment/Gulf of Mexico Pipeline Activities (USDI, MMS, 1983c) discusses possible general impacts of pipeline emplacement in the AEA offshore and coastal area. Impacts resulting from a specifically proposed pipeline will be evaluated in an SEA for the subject development plan and in a CER at the pipeline application stage. Since existing onshore support bases are expected to be used for activities in the AEA area, impacts associated with facility construction are omitted. If facilities are proposed in a specific plan, impacts would be discussed in an SEA.

A. ACCIDENTAL HYDROCARBON DISCHARGES

1. Oil Spill Accidents

Drilling operations account for less than 6% of oil spillage into Gulf waters and only 9% of the total accidents occurring between 1967 and 1980 (USDI, MMS, 1983b). The total number and volume of oil spillage from mobile and fixed drilling units in the Gulf of Mexico Outer Continental Shelf from December 1974 through September 1984 is given in Table IV-1.

Table IV-1

Total Number and Volume of Oil Spillage
Mobile and Fixed Drilling Units
Gulf of Mexico Outer Continental Shelf
(12/74-9/84)

Spill Size	Number of Spills	Volume of Spills (bbls)
Less than 50 bbls	91	635.35
Greater than 50 bbls, less than 1,000 bbls	11	1,923
More than 1,000 bbls	1	1,500
TOTAL	103	4058.35

Note: Volumes for spills less than one barrel are assumed to be spills ½ barrel each.

Note: Statistics for spills less than 50 barrels were not kept before 1974 because of less stringent accident investigation requirements; therefore, comparisons of volume and number of spills are done only on statistics collected after 1974.

Source: USDI, MMS, 1984a.

Including blowouts, more than 50% of oil spillage events result from human, engineering, or equipment errors (USDI, MMS, 1983b). Information from the northern Gulf for a period of 1964-1984 shows a total of 53 blowouts for mobile and fixed drilling units, with only five blowouts resulting in the loss of oil and/or condensate. The total spillage from these five incidents was approximately 2,501 barrels. Five blowouts contributed either minimum amounts or unknown amounts (USDI, MMS, 1984a). Most blowout spillage results from producing oil wells, not from oil wells being drilled (USDI, MMS, 1983b). A recent gas blowout has occurred 3,609m (1,100 ft) from the West Flower Garden Bank on High Island Area, South Addition, Block A-397 on February 2, 1984, during cementing operations for the No. 1 well location. No pollution or drill mud spillage was detected and the semisubmersible rig was back in full operation by February 24, 1984 (USDI, MMS, 1984a).

As indicated in Table IV-1, spills greater than 1,000 barrels accounted for approximately 37% of the total volume of oil spilled from federally funded oil activities in the Gulf of Mexico OCS from 1974-1984. Spills less than 1,000 barrels accounted for approximately 63% of the total oil spillage. Spills less than 50 barrels account for 16% of the oil discharged accidently into Gulf waters (USDI, MMS, 1984a). Based on volume alone, smaller spills do not play as significant a role in potentially impacting the Gulf environment as the large spills. However, what may be important in a discussion of chronic long-term effects is not the volume spilled but the frequency of oil spillage less than 1,000 barrels. Although the effect to the marine environment of these smaller spills is unknown, the spills may represent a continuous and persistent stress to the exposed area. Low-level chronic oil pollution may have more long-term harmful consequences to the ecosystem than the isolated large spills (i.e., spills greater than 1,000 barrels) (USDI, MMS, 1983b).

2. Vulnerability of Coastal Land Segments/Target Areas to Oil Spills

One of the most important factors which influences the amount of damage done by an oil spill to the coastline is the geographic location of the spill. Using representations of winds and currents, hypothetical oil spill trajectories were simulated as a part of the Oil Spill Risk Analysis (Labelle, 1982) for each of the 143 spill areas making up the Eastern, Central, and Western Planning Areas of the GOM OCS. Those spill areas contained in the AEA area (spill areas: 21, 22, 28, and 29) are depicted on Figure A. The results of these trajectory simulations were used to calculate the probabilities that an oil spill starting at a particular location will contact a certain land segment or target of special interest within 3, 10, or 30 days. For the purposes of the Oil Spill Risk Analysis, the entire Gulf coastal area was divided into land segments by county/parish. Land segment designations comprising the AEA coastal area are listed in Table IV-2 and depicted on Figure B. The special target area of interest for this assessment is the Flower Garden Banks depicted in Figure A.

Table IV-2

County/Parishes Comprising Land Segments Adjacent to the AEA Area

Land Segment	County/Parish Name
1	Cameron, Texas
2	Willacy, Texas
3	Kenedy, Texas
4	Kleberg, Texas
5	Nueces, San Patricio; Texas
6	Aransas, Texas
7	Calhoun, Refugio, Texas
8	Matagorda, Texas
9	Brazoria, Texas
10	Galveston, Chambers; Texas
11	Jefferson, Texas
12	Cameron, Louisiana
13	Vermilion, Louisiana
14	Iberia, Louisiana
15	St. Mary, Louisiana
16	Terrebone, Louisiana
17	Lafourche, Louisiana
18	Jefferson, Louisiana
19	Plaquemines, Louisiana
20	St. Bernard, Orleans, St. Charles, Louisiana

Source: LaBelle, 1984.

A summary of the trajectory analysis (for 10 days) representing all potential oil spill sites in the AEA area is presented in Table IV-3. Table IV-3 is based on the assumption that an oil spill has occurred in one of the hypothetical spill locations in the AEA area and gives the percent chance that an oil spill starting in one of the indicated spill locations will contact a certain land segment or target (i.e., Flower Garden Banks) within ten days. Ten days was chosen as the most likely oil slick sea surface residence time, because after ten days the oil properties have changed extensively (Refer to Section IV.A.3.).

Table IV-3

Trajectory Simulation Summary for the AEA Area[1]

Land Segment[2]/Target[3]	Hypothetical Spill Locations W* 21	W 22	W 28	W 29
8	1	1	n	n
9	n	6	n	n
10	n	7	n	3
11	n	n	n	1
Flower Garden Banks[3]	1	1	45	34

*Western Planning Area

[1] Percent chance that an oil spill starting at a particular location will contact a certain land segment or target within 10 days.

[2] Only those land segments having greater than a 0.5% chance of an oil spill contacting it are given. See Table IV-2 for those land segments adjacent to the AEA area having less than a 0.5% value.

[3] Percent chance does not indicate actual contact with the Flower Garden Banks, only the chance for a spill to occur in the surface vicinity of the Banks. Factors such as depth of the topographic highs were not included in the trajectory simulations.

n = less than 0.5 percent

Source: LaBelle, 1984.

As indicated in Table IV-3, land segment 10 (Galveston/Chambers, Texas) is the most vulnerable to oil spills occurring in the AEA offshore oil spill areas.

3. Assumptions About the Characteristics and Fates of an Accidental Oil or Gas Discharge at the Flower Garden Banks

Hydrocarbon reserves around the Flower Garden Banks are expected to be natural gas. Quantities of oil, however, are normally recovered from gas wells so the presence of both oil and gas will be considered in this assessment.

Gas vented into the sea from a producing well or pipeline rupture would rise rapidly to the sea surface and dissipate into the atmosphere. Soluble fractions would dissolve in the water. However, few extensive studies have assessed the impact of petroleum-formed (petrogenic) natural gas on the marine environment. Biogenic natural gas seeps have been documented at both the East and West Flower Garden Banks (USDC, NOAA, 1979).

It is assumed that oil spills occurring in the AEA area would have characteristics similar to Louisiana crude (a light, very low asphaltene oil), although variations in composition can be expected from oils produced from different formations or fields within each region or between areas. Spilled Louisiana crude disperses and degrades rapidly under the influences of the Gulf's warm climatic conditions and the properties of the oil. Ten days is chosen as the most likely oil slick sea surface residence time. After ten days, the oil properties have changed extensively. The original volume has decreased greatly; 47-67% of the original slick volume is lost from the water's surface (Table IV-5). The floating oil is largely devoid of its volatile (acutely toxic) components and is gradually forming emulsions. By four days, enlargement of the slick is completed, and actual spreading is subordinate to fragmentation and dispersion. Dominant processes affecting spilled oil during ten days or less include spreading, evaporation, dissolution, and dispersion. Dominant processes altering a slick's characteristics after ten days include emulsion formation, sedimentation, auto- and photo- oxidation, biological processes, and tar residue formation (USDI, MMS, 1984b). Table IV-4 gives the time scale (in days) for the dominant effects of the weathering processes. Percent volume loss from the slick from the sea surface after 10 to 30 days is indicated in Table IV-5.

Table IV-4

Time Scale (in days) for Weathering Processes[1]

Process	Time Scale (in days)
Evaporation	1-10
Dissolution	1-10
Dispersion	1-30
Auto-Oxidation	3-365
Biodegradation	5-720
Sinking and Sedimentation	10-365
Tar Residue	10-365

[1] Assumption is that spill does not contact land.

Source: USDI, MMS, 1984b.

Table IV-5

Percent Volume Loss from the Slick from the Sea Surface after 10 or 30 Days[1]

Process	% Loss of Original Slick Volume (10 days)	% Loss of Original Slick Volume (30 days)
Evaporation	45%*-25%	45%*-25%
Dissolution	less than 1%	1%*-5%
Dispersion	10%	included in sinking and sedimentation rate
Auto-oxidation	less than 1%	5%
Biodegradation	1%	included in sinking and sedimentation rate
Sinking and Sedimentation	1%	34%*-20%
Tar Residue	less than 1%	1%*-30%
Offshore Skimming and Recovery Cleanup Operations	10%	15%
Total Volume Loss from Water Surface	67%*-47%	100%

[1] Assumption is that spill does not contact land.

* Ranges given provide an overview of crude oil fate in general. The first number (with an asterick) represents the most likely percent loss of Louisiana crude due to that process.

Source: USDI, MMS, 1984b.

When initially spilled, most crude oils float. However, some of the oil is dispersed and retained in the water column. It is the oil that is retained in the water column that is of concern when assessing the effects of an oil spill to the Flower Garden Banks. The mechanisms which result in oil being retained in the water column include dissolution, dispersion, sinking, and sedimentation (Table IV-5) (Ibid).

About 1%-5% of the volume of the surface slick is predicted to occur in the water column in the vicinity of the spill. Some of this oil will reach bottom sediments. The relative amount of oil which resides in the water column is a function of a number of factors, including, the chemical and physical nature of the oil, the point of release (surface versus subsurface) and the hydrographic conditions affecting the slick formed, particularly sea surface turbulence. The location of subsurface oil is governed by the density stratification of the water column. The submerged oil exists in association with strong water temperature and salinity gradients (Ibid).

Since the Flower Garden Banks overlie a known area of shallow gas deposit, the Pleistocene trend stretching perhaps 160km (87 mi) along the outer edge of the continental shelf, the AEA area may be blowout prone. A type of blowout that could be the most devastating, if it were to occur, to the Flower Garden Banks is the type which occurred in March 1977 in High Island Area, South Addition, on Block A-562 about 64km (35 nm) west of the Flower Garden Banks. This massive blowout, which was vented from the seafloor, resulted in the loss of the drilling platform, and formed a circular crater, 137m (450 ft) deep and 490m (1,600 ft) across. After a five month period, a gas seepage of about 11,330cu m (400,000 cu ft) per day was still occurring. If a blowout of this magnitude were to occur within 4nm up-current from the Banks, a tremendous load of sediment, virtually undiluted, could be dumped on the Bank and reef communities possibly resulting in a disastrous decline in the reefs. However, the High Island blowout has been the largest of its type and the possibility of the occurrence of another blowout of the same magnitude is low (USDC, NOAA, 1979). Accordingly the February 2, 1984, blowout which occurred in the vicinity of the West Flower Garden Bank was of a much smaller magnitude (refer to Section IV.A.1).

The impact of a blowout involving oil would include effects such as these described for surface oil spills, although a blowout in which oil is vented from the seafloor could generally be more hazardous to biota than a surface spill due to the higher rate in which soluble fractions would enter seawater as the oil floats to the surface (Ibid).

One such blowout, IXTOC-I, was studied in great detail. Occurring in approximately 48m (157 ft) of water 80km (50 mi) northwest of Cuidad del Carmen, Mexico, on June 3, 1979, IXTOC-I resulted in an estimated rate of release of oil for the first four months ranging from 10,000 to 30,000 barrel/day. The concentrations of oil in the water column measured around the site of the IXTOC-I blowout ranged from values of less than 5 ug/L at a distance of 80km (50 mi) from the blowout to peak values of 10,600 ug/L within a few hundred meters of the wellhead. Although surface oil was found 80km (50 mi) or more to the northeast of the well, elevated concentrations of oil in the water column were limited to within 40km (25 mi). It is therefore evident that somewhat dissimilar processes were controlling the transport of surface and subsurface oil. The subsurface plume of oil droplets suspended in the top 20m (66 ft) of the water column extended 25km (16 mi) to the northeast of the blowout and appeared to move in response to ocean currents rather than the wind (Fiest et al., 1980). The absence of high concentrations of oil at depths below 20m (66 ft) in the plume may have been the result of three processes. First, the plume of oil and water streaming from the blowout in the seabed had a net upward velocity that could have caused it to rise quickly to the surface where it spread horizontally in response to prevailing currents. Second, the positive buoyancy of the oil droplets within the plume may have caused them to move vertically within the plume and remain close to the surface. Third, droplets of oil could have been generated by turbulence at the air/oil interface and subsequently driven down into the water column. The slightly positive buoyancy of the droplets would have retained them near the surface. Although there was no evidence to favor one hypothesis over another, Fiest and Boehm (1980) concluded that the formation of oil droplets acts to concentrate the oil close to the surface (Ibid).

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Based on evidence determined from the IXTOC-I blowout, it is estimated that approximately 1% of the total oil spilled would be present in the subsurface [2-20m (7-66 ft)] zone within a 25km (16 mi) distance from a blowout source. Of this material, about 90% would be particulate and about 10% dissolved and/or collidal in nature (Boehm et al., 1980b). Concentrations of some of the more toxic components appeared in the water column in sizeable amounts. The researchers reported that these values fell well within the range of observable effects on marine organisms (USDI, MMS, 1984b). Minor quantities of the total spilled oil 0.5-3% may reside in surface sediment layers within 50km (31 mi) of a blowout site. Concentrations of oil in the sediments after the IXTOC-I blowout were detected as high as 100ppm but probably would be much higher closer to the well and in the top layer [(0-10mm (0-0.4 in)] of sediment (Boehm et al., 1980a).

Although the topographic features stipulation protects banks from oil and gas activity, the stipulation does not protect banks from adverse effects of an accident such as a large blowout on a nearby oil or gas operation. Fortunately, not only are blowouts rare in the Gulf, but the probability of an oil blowout at the Flower Garden Banks is much less than a gas blowout because the composition of the resource at the Banks is mostly natural gas (USDI, MMS, 1984b).

4. Effects of Oil Spills on the Environment

Coastal habitats - The effects of crude oil spills on coastal ecosystems have received considerable attention and have been discussed in detail in the FREIS, Volume 1, Section IV.B.3.d. and IV.B.4. Important variables discussed include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated (i.e., marsh, beach, estuary, etc.), the climate and weather at the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills. The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Estuarine organisms can be exposed to long periods of contamination because the vegetation traps and holds the contaminants. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. Spartina spp. of the Gulf coastal salt marshes have been shown to withstand moderate single doses of hydrocarbons, but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plant species would probably be most affected by a spill during the growing season when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach coastal water.

The levels of impacts to coastal ecosystems depend on the magnitude of an oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation and other biologically productive habitats will be severe and may be relatively long-term.

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Oil spills that occur in coastal wetlands can cause severe and often long-term adverse impacts. Marsh vegetation is extremely sensitive to oil spills; subsequent cleanup operations are often difficult, if not impossible, to conduct without causing additional damage to the vegetation. The recovery time of coastal wetlands from an oil spill may range from several months to many years, depending on the severity of the spill and the vegetation involved.

The principal adverse impacts of spilled oil contacting coastal marshes manifest themselves in the death or greatly reduced viability of the vegetation involved. Marsh destruction causes loss of habitat and biological productivity as well as soil erosion and land loss, which represents a permanent adverse impact on coastal habitats. Although unlikely, the possibility exists that a relatively large oil spill contacting sensitive coastal habitats would be followed by another spill in the same area. The cumulative effects of successive oil spills on coastal habitats would be severe and long-term (USDI, MMS, 1983c).

Benthic communities - Oil spills, although possible, are not expected to pose a significant threat to coral communities and topographic highs (i.e., East and West Flower Garden Banks). The likelihood of oil on the surface of the water reaching the area of the Flower Garden from one of the hypothetical spill points is shown in Table IV-3. The problem of subsurface transport of oil is discussed in Section IV.A.3. The tops of the banks are often above the thermocline, thus making the biota of the banks potentially susceptible to impingement by oil-laden subsurface water. However, it is expected that under normal conditions the subsurface currents flowing around the banks which keep them clear of sediment will also serve to keep the banks from accumulating any oil. With a platform at or very near the bank, the risk to the bank would increase in the event of a blowout or oil spill accident; however, both events have low probabilities. Were one to occur, the effluents could impinge directly upon the edge of the bank. Impacts then could be serious to the local biota (USDI, MMS, 1984b). See Section IV.A.3 for a discussion of oil in the water column and the following section on water quality.

Endangered species - An accidental oil spill occurring onshore would have a minimal impact on endangered and threatened species habitat with the possible exception of those species whose established nesting areas are on the ground. Habitat destruction and some mortality could occur, but these impacts would be short-term and localized.

Oil spills contacting a turtle nesting beach during egg incubation or hatching periods (July-August) could cause significant turtle mortality. According to Fritts and McGehee (1982), "For oil to reach the nesting zone, it must be transported there by extremely high tides. Since saltwater inundation in known to kill developing sea turtle embryos (McGehee, 1979), such a peturbation, even in the absence of oil, might cause clutch mortality." Fritts and McGehee also conclude that "from a management viewpoint, turtle nesting beaches are not as vulnerable to petroleum damage as might be expected," because "the most drastic effects of a one-time oil spill are relatively short-lived and would threaten at worst a single year's reproductive effort." Some evidence indicates that juvenile sea turtles are transported by passive drift and are associated with density shear lines and sargassum weed. This could prolong their exposure to a large oil slick transported in a similar manner. Sea turtles, especially juveniles, will snap at or attempt to swallow any object of an appropriate size, such as tar balls. Tar ball ingestion has

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been recorded and could result in considerable mortalities. Sea turtles must surface to breathe and could contact surface oil slicks. The volatile, soluble and tar factions of an oil spill could affect the lungs of sea turtles reducing ventilation and reducing time for feeding. Ingestion of oil could affect the gastrointestinal tract by reducing absorption. Oil coating the head and eyes could affect the orbital salt glands which may affect many physiological processes.

No injuries or impacts to whales have been documented from oil spills. The brown pelican may be affected by the coastal impact of spills. The pelican is extremely susceptible to disturbance and habitat alteration of nesting areas; this may cause nest desertion and egg losses. Brown pelicans may be further susceptible to oil spills because as they dive for fish their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that may become oiled by contaminated adult birds (USDI, MMS, 1983c).

Other wildlife including migratory waterfowl - Pelagic birds may be susceptible to oil spills because as they plunge-dive for fish their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that become oiled by contaminated adult birds.

Oil spillage could potentially affect marine mammals, but evidence shows it to be unlikely. Dolphins have been observed swimming and feeding in oil slicks with no apparent ill-effects. Oil apparently does not adhere to their smooth skin. Dolphin skin exposed to gasoline and crude oil for up to 75 minutes became discolored but otherwise showed no evidence of damage. It is unlikely that dolphins would inhale oil into their blowhole while breathing. Some hydrocarbon-contaminated food or water could be ingested by marine mammals, but the effects of long-term accumulation of hydrocarbons in marine mammals is unknown.

Of the coastal and marine birds discussed above, the diving seabirds and waterfowl are probably the most vulnerable to OCS oil spills. The more likely bird species to be affected are : common loon, horned grebe, double-crested cormorant, red-breasted merganser, lesser scaup, tern, and gull species.

The effects and variability of bird species' susceptibility to oil pollution are well documented. Crude oil is less toxic than refined oils (diesel oil, Bunker "C," etc.); and fresh oil causes more damage than older, more weathered oils. Direct oil contact usually causes substantial bird mortality. Oiling of birds causes death from hypothermia, shock, or drowning; oil ingestion significantly reduces reproduction in some birds; and oil contamination of eggs by oil-fouled adult birds reduces egg hatchability.

Indirect effects of oil pollution on birds include contamination, displacement, and reduction of food sources. Long-term contamination of food sources and habitats may cause chronic toxicity to birds through the accumulation of hydrocarbon residues and may affect their behavior, physiology, and reproduction. Data have shown that birds may tend to avoid areas of oil spills on beaches and open water (Ibid).

Commercial fishing - Commercial fisheries may be adversely impacted by an oil spill. Soluble aromatic hydrocarbons can be lethal to adult fishes in low concentrations (1-100 ppm) and to the more sensitive larval stages at even lower concentrations (0.1-1 ppm). Crustaceans appear to be the most sensitive (1-10ppm) while fish and bivalves are moderately sensitive (10-100 ppm); however, lethal concentrations may be lower (0.2-1 ppm) for the more sensitive larval and juvenile forms. Certain fish eggs are extremely sensitive to the influence of oil products.

Oil spills that contact the coastal marshes, bays, and estuaries have the greatest potential for damage to offshore commercial fishery resources. The majority of the Gulf's fishes are estuarine dependent. Potentially, oil spills could seriously impact fishery resources such as shrimp and many species of finfish that use these areas as nursery and/or spawning grounds, as well as sessile organisms such as oysters.

An offshore oil spill that does not contact the bays could still destroy large numbers of floating eggs, larvae, and juveniles and could disrupt fishing (such as reef fishing or shrimping) if the spill occurs in close proximity to the localized fishing area. The duration of the impact would probably be short-term (less than one year in duration) (Ibid).

Recreation/tourism - Crude oil, or its residue, that finds its way onto shoreline resources will impact recreational areas and, consequently recreational use. Should a major spill affect a shoreline recreational area, public use and enjoyment of the area would be precluded during the time that oil covered the beach or the shoreline area and during the clean-up process. Oil cast upon a beach or shoreline area would impact the aesthetic value for both users and owners. These impacts would be more keenly felt if the area is extensively used or considered as having unique or outstanding recreational value. The effects of an oil spill would vary depending on the size, duration, season, and specific location of oil coming onshore.

Not only would the impacts of an oil spill be felt by recreational users of an area, but also in the business community where economic well-being depends on the use of recreational resources by tourists (USDI, BLM, 1979). Should a pollution incident retard recreational use, then tourism and ultimately local economy could be affected. For example, if during the height of the recreational season an oil spill extends to shoreline areas such as beaches, a resultant loss would be felt in the economy because residents and tourists would be unable to use the contaminated area or an area undergoing clean-up. Activities such as swimming, water skiing, diving, boating, spearfishing, and fishing for finfish and shellfish would be precluded in the areas tainted by an oil spill. Water enhanced activities such as beachcombing, camping, or sunbathing on beach or marine associated shorelines would also appear less attractive for an indeterminate period of time in an oil spill area. Oil contaminated waters would be avoided during the duration of the spill by recreational boaters, divers, and sports fishermen. Some beachfront wildlife appreciation, hunting or fishing in wildlife conservation areas could be temporarily precluded in a worst case oil spill impact situation (USDI, BLM, 1981).

The investigation of the Ixtoc I and Burmah Agate oil spills, which occurred in the Gulf of Mexico in 1979 (Restrepo and Associates, 1982), considered the entire Texas coast and found subregional economic impacts amounting to approximately \$3 million on the recreational sector and \$4 million on the tourism sector. The economic impacts suffered by the recreational sector were not equally distributed within each subregion but were confined to a small number of beach and nonbeach-related businesses located close to the water's edge. Some social losses (the value of the day at the beach foregone because of a spill) are difficult to detect and measure in dollars and cents, especially in the recreational sector where many user occasions are not reflected in market transactions. All detectable impacts occurred in the year

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of the initial spill. Seasonality and media coverage were shown to influence the severity of the oil spill impact on recreational tourism. Damages to the tourism and recreational industries from oil spills have been temporary (less than one year) and compensable (USDI, MMS, 1983c).

Cultural resources - Indirect impacts to onshore and offshore archaeological sites could result from both major oil spills and chronic, low level hydrocarbon contamination and would include destruction of the C-14 dating potential of prehistoric sites, and visual impacts to sites through direct contamination of a site or through contamination of the surrounding environment (Ibid).

Water quality - In addition to that portion of hydrocarbons resulting from natural sources due to submarine seepage and from biochemical synthesis, the accidental discharge of petroleum hydrocarbons into the Gulf's water can be expected to impact the water quality of the Gulf. These hydrocarbons may be transported to benthic sediments, entrained, or released into the water column over a period of time, or may be taken up by a variety of benthic and pelagic marine organisms.

Petroleum hydrocarbon discharges, due to oil spillage, are events whose occurrence and volume are not easily predicted and depend upon numerous variables as to their volume, oil type, and effects on the marine environment. Their impacts on open ocean water quality would be significant although of a temporary nature in the case of a large acute spill. Physical oceanic processes would aid in mechanically breaking up oil slicks and contribute to weathering the oil along with photochemical oxidation and biological processes (refer to Section IV.A.3). Weathered oil would eventually sink to the bottom and become incorporated into benthic sediments where further oxidation would occur. Oil spilled into estuarine environments would pose a more serious problem due to the lessening of weathering processes. These hydrocarbons may be entrained in estuarine sediments and re-released into the water column during the tidal cycles. The reworking of these sediments by physical forces (tides, currents, and waves) and by bioturbation would counteract the effects of burial and reexpose hydrocarbons to continued biochemical interactions with the sediment-water interface.

Both large volume oil spillage and smaller oil spills not contacting the shoreline or cleaned up will weather and eventually sink to the seabottom or remain suspended as tar balls in the water column at different density gradients. That oil incorporated in benthic sediments will undergo further oxidation or be re-released into the water column. Benthic or pelagic tar residue could be taken up by a variety of marine organisms. The life of a tar ball has been estimated to be between 1-2 years. However, as stated previously, Louisiana crude and other northern Gulf of Mexico oils do not seem to form tar balls. Long-term regional water quality degradation is expected to be very low, if at all, as a result of accidental release of petroleum (Ibid).

Air quality - Degradation of air quality in coastal areas due to evaporative losses from oil spills is not expected to occur due to the rapid breakup that normally occurs and the low level turbulence and offshore variability associated with offshore winds. These two factors would be very effective in dispersion of these emissions except when a major spill occurred near land and remained fairly cohesive, and local winds prevailed in the onshore direction at the time of the event. A large spill (10,000 bbls) could emit hydrocarbons at the rate of 570,000 lbs/hr (258,552 kg/hr) and

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290,000 lbs/hr (131,544 kg/hr) for the first and second hour respectively. Additionaly, evaporation losses throughout the first ten days could amount to 45% of the spill. In such a situation, short-term degradation of onshore air quality could occur (Ibid).

5. Oil Spill Containment/Cleanup Capabilities and Effectiveness

Along the Western Planning Area coastline (which includes U.S. Coast Guard Marine Safety Office areas; Corpus Christi, Galveston, Houston, and Port Arthur); 55 establishments occur which maintain oil spill response equipment; 22 cooperatives, private or government operatives, or contractors exist whose sole purpose is oil spill response, and six of these have offshore response capabilities (USDI, MMS, 1984b).

Offshore containment/cleanup operations are major tasks requiring significant coordination and cooperation, transportation of large equipment, vessel suport, aircraft support, set-up and maintenance of a command/ coordination post in the field, and properly staged and available equipment. Often, the weather/sea conditions and crew fatigue become the critical factors during these operations. As the seas approach heights in excess of 2m (5 ft), these operations become increasingly more dangerous and ineffective. Offshore containment/cleanup operations are, in general, marginally effective. It is possible, however, to contain a platform spill if environmental and logistical conditions are right. The effectiveness of this type of containment and cleanup operation is estimated to be approximately 5-15% recovery (Ibid).

The effectiveness of a containment/cleanup operation in an inshore area largely depends on the unique physical characteristics of the environment and the area of the operation. The range of effectiveness is from marginally successful to successful (Ibid).

B. IMPACTS CONCERNING THE PHYSICAL ENVIRONMENT

1. Impacts Concerning Geology

Within the Gulf of Mexico major geohazards to oil and gas development are associated with seafloor geologic features which result in seafloor instability. These hazards present many operational limitations to the exploration and development of oil and gas. Seafloor instabilities present limitations and necessitate adaptations in the siting, structural engineering, and routing of pipelines, exploratory drilling and production platforms (USDI, MMS, 1984b). Three conditions prevail in the Gulf of Mexico which cause unstable conditions on the seafloor:

1) salt movement which may result in salt domes, faults, steep slopes, gas seepage, and sediment slumping;
2) sediment overloading and differential compaction causing growth faults and differential subsidence; and
3) rapid sedimentation in deltaic areas that result in unconsolidated, fine-grained, often gas charged sediments.

Because the East and West Flower Banks are bathymetric prominences caused by salt diapirs, unstable conditions related to salt movement could be expected. The central graben at the East Flower Garden Bank has developed

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partly due to the tensional stresses during up-lift and the removal of salt from the crest of the ridge by dissolution. Fault movements can be expected to continue as long as salt is being dissolved from the crest of the salt stock (Rezak et al., 1983). As long as the formation of the crestal graben and resultant faulting is likely to continue at the East Flower Garden Bank, Rezak (1981) concluded it would be unwise to emplace any permanent structures in close proximity to the bank. The structure of the West Flower Garden Bank is typical of a mature salt diapiar in which crestal faulting has occurred; therefore, similar concerns are not warranted for this Bank. Another potential geologic hazard to be considered when drilling in the vicinity of the Flower Garden Banks is the potential for collapse. As indicated in Section III.B.1., the removal of large volumes of solids could eventually create sizeable caverns beneath the cap rock and the overlying reef resulting in a collapse. The magnitude of such a collapse would depend upon whether or not the cavern reached considerable size before a failure occurred (Rezak et al., 1983).

Since the Flower Garden Banks overlie a known area of shallow gas deposit, the Pleistocene trend stretching perhaps 160km (87 mi) along the outer edge of the continental shelf, the Banks area may be blowout prone (USDC, NOAA, 1979). A recent gas blowout has occurred 3,609m (1,100 ft) from the West Flower Garden Bank on High Island Area, South Addition, Block A-397, on February 2, 1984, during cementing operations on the No. 1 well location. No pollution or drill mud spillage was detected and the semisubmersible rig was back in full operation by February 24, 1984 (USDI, MMS, 1984a).

In accordance with NTL 83-3 and prior to the installation of any structure or pipeline, the grantee shall conduct a shallow hazard analysis in the immediate area of the proposed activity to locate, identify, and assess the potential geologic hazards and engineering constraints that may be present (USDI, MMS, 1984b). Most structures and equipment used for mineral exploration and development can be designed to withstand the stresses of the continental shelf environment if adequate information is available. Studies developed under the former Bureau of Land Management Environmental Studies Program have been especially directed toward areas where more detailed geologic information was needed for intelligent management of the OCS mineral leasing program.

Additional information concerning potential geologic hazards will be addressed in subsequent SEA's on a site-specific basis for proposed activities within the AEA area.

2. Impacts Concerning Meteorology

Significant severe weather conditions are an exception rather than a rule in the northwestern Gulf. Approximately 90% of the time, weather would not affect oil and gas activities. Consequently, there is little or no evidence that any offshore operations would affect or be very much affected by the general meteorological conditions found in this area. However, there are several periodically occurring weather factors which could affect some phase of operation. First, hazardous conditions and damage to facilities can be expected at least once each year during hurricanes. Second, severe winter storms may cause delays in the operation but should not cause structural damage as these storms are short-lived (24-36 hours) and do not have time to build up a destructive ocean wave. Third, in the winter months, dense fog may hamper navigation and thus interfere with supply boat traffic for several days.

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3. Impacts Concerning Physical Oceanography

Oil and gas activities in the analysis area are not expected to have any effect on the physical parameters (currents, tides, and wave activity) of the environment. Regulated discharges and other oil and gas activities are not expected to have an effect on sea temperature or salinity other than a very localized effect near discharge outlets where the dispersion and diffusion processes begin.

Oceanographic conditions such as high velocity currents, large waves, storm surge, etc., could adversely affect activities in the analysis area. Although mechanical equipment and operations procedures are designed to cope with extreme environmental conditions, it is not common practice to design for maximum conditions that could be encountered in the working area but rather to some maximum expected condition over the life of the structure or operation, i.e., a 25-year wave, 30-year storm, etc. Thus, it is possible during the lifetime of a structure (even during short-term exploration) that the design limits of the equipment may be exceeded, or mechanical degradation and/or minor failures may progress to the point that physical conditions less than the design limits could result in major failure.

Extremely high winds and turbulent water conditions could cause a column of air (unknown in height) directly above the sea surface to become near saturated with water. The effect of this saturated air forcefully blowing on a structure imposes major forces. The combined effect of this phenomenon, in addition to the forces imposed by high waves and currents during a storm, may cause major structural damage and/or failure in conditions less than design limits. Other environmental conditions that may lead to an adverse effect on oil and gas operations are summarized in Sections III.A.2.e. and III.A.3.

4. Impacts on Water Quality

Under normal offshore operations, varying degrees of water quality degradation would occur as a result of oil and gas activities in the analysis area. Wastes from these activities are varied and may be transformed chemically, biologically, or radioactively when introduced into the marine environment. These wastes may be dissolved and form new substances or be mixed vertically and horizontally in the water column by small-scale motions or large-scale currents. They may fall into the bottom sediments to be recycled by these same processes. This series of transformations or chemical reactions will govern a waste's transport through the water column and its toxicity to marine organisms. The bio-effects described may be on individual organisms or whole ecosystems, with long-term effects such as changes in reproductive habits or genetic make-up of species occurring. The method of delivery to the environment as well as intrinsic chemical properties of each source would influence a waste's distribution throughout the area.

Due to the complexity of waste movement and behavior, several parameters are needed to determine the extent of impact. Specification of point source functions, the form of the waste, rate of release, frequency of disposal, and geographical location of disposal are parameters essential in determining the extent of impact on water quality in the area. Also important are the resources impacted, the duration of impact, and the period of recovery. Potential water quality degradation resulting from offshore oil and gas exploration would be governed by several factors which include the resuspension of bottom sediments through exploration activity; the discharge of deck drainage, sanitary wastes, and domestic wastes; the discharge of formation waters; the discharge of drilling fluids and muds; accidental hydrocarbon discharges due to spills, blowouts, etc.; and the discharge of radionuclides into the marine environment.

Impacts resulting from resuspension of bottom sediments may include increased water turbidities and mobilization of sediments in the water column containing highly concentrated pollutants. The magnitude and extent of any turbidity increases would depend on the hydrographic parameters of the area, duration of the activity, and bottom material composition. The toxic effects of some of these pollutants could be long lasting in confined areas, depending on the quantities disturbed, local hydrographic effects, and the biota of the immediate area.

The discharge of treated sanitary and domestic wastes from the various facilities regulated by National Pollutant Discharge Elimination System permits will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge. Some residual chlorine may be present in discharged waters following treatment; however, due to evaporation and conversion to other chemical forms when combined with seawater, it is quickly diluted.

The discharge of formation water and chronic spills from drilling rigs would result in increased petroleum hydrocarbon levels and possible trace metal concentrations in the marine environment. Formation waters may contain high concentrations of total dissolved solids, oxygen demanding wastes, and toxic metals, in addition to oil and grease contaminants. Environmentally high levels of naturally occurring radionuclides are also present in these formation waters, up to four levels of magnitude higher than are found in open seawater. Though these levels are high, they do not seem to pose a hazard to the offshore environment due to the rapid dilution of these waters when discharged. Aside from that portion of hydrocarbons resulting from natural sources due to submarine seepage and from biochemical synthesis, the accidental discharge of petroleum hydrocarbons into the Gulf's waters due to blowouts, vessel collisions, etc., can be expected to impact the water quality of the Gulf. Effects of oil spills on water quality are addressed in Section IV.A.4.

The discharge of drilling muds, sand, and drill cuttings, which are regulated by NPDES permits, may create turbidity plumes several hundred yards in length but would only affect those waters in the immediate vicinity of the rig. Drilling fluids, commonly called "muds," perform a variety of drilling functions, such as removing particles cut by the bit, cooling and lubricating the bit as it cuts, maintaining downhole pressure, and stabilizing the walls of the borehole. Most of these muds are water based; however, some have an oil base and are used in special situations, primarily freeing stuck drill pipe. These oil based muds contain carefully formulated mixtures of oxidized asphalt, organic acids, alkali, stabilizing agents, and high flash diesel oil, presenting a high potential for pollution. Aside from the normal use of muds and fluids during exploration phases of oil and gas extraction, well service and tertiary recovery techniques may contribute as sources of wastes and pollutants. For additional information refer to the FREIS (USDI, MMS, 1983b).

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5. Impacts on Air Quality

Onshore - Marine and helicopter traffic operating out of established bases is not expected to contribute to significant degradation of onshore air quality. The limited number of helicopter and boat trips usually scheduled to support offshore operations should not add a significant amount of pollutants to the air.

Establishing a new onshore support base would add some air emissions onshore. Again these emissions should not be significant. Maximum emissions of nitrogen oxides from surface vessels, assuming one trip per day, would be near 0.1 ton per day. Other pollutants are about one order of magnitude less. Maximum emissions of carbon monoxides from helicopter landings and take offs, assuming one trip per day, would be near 12 pounds per day. Other pollutants are about one order of magnitude less (USEPA, 1976). Oil spill impacts are discussed in Section IV.A.4. Site specific evaluations will be calculated at the time of submission of an operational plan. This information will be presented in a subsequent SEA.

Offshore - The major predictable source of air pollutants associated with oil and gas activities originates from the stationary combustion diesel engines which provide the power for the drilling rig. Nitrogen oxides (NO_x) would be the predominant pollutant. Other pollutants; carbon monoxide, volitile organic compounds, total suspended particulates, and sulfur oxides would be a much lesser amount (Ibid).

In a worse case scenario, continuous drilling for 365 days each year, the emissions of NO_x would amount to 217 tons (Radian Corp., 1982). Activities would occur a minimum of 185km (115 mi) from shore. The 30 CFR 250.57, contains provisions for determining significant emissions from oil and gas exploration and producing activities. No significant degradation of the ambient air quality is expected because of the normal mixing and dissipation due to climatic conditions.

C. IMPACTS ON THE BIOLOGICAL ENVIRONMENT

1. Impacts on Coastal Habitats

Impacts to the coastal environment from oil and gas activities in the assessment area would result from oil spills, increased boat traffic, and possible new onshore facility construction. Oil spill impacts are discussed in Section IV.A.4. Increased boat traffic alone would cause a slight increase in discharge to the surrounding waters and extra wake disturbance to the shoreline. The expansion of existing onshore facilities, the construction of new facilities, or pipeline construction to shore could have a serious impact to the the coastal environment. Construction might entail alteration of habitat and dredging or deepening of channels. Onshore facility construction is not expected in the AEA coastal area. Should coastal habitat impacts be expected from a specific activity, they would be discussed in an SEA.

2. Impacts on Offshore Habitats

a. Impacts on the Pelagic Environment

There may be a temporary and localized adverse effect on the phytoplankton and zooplankton due to the plume caused by the temporary resuspension of bottom sediments during placement of offshore structures and the disposal of drilling muds and cuttings. The impacts on the plankton would depend on the residence time for the organisms within the plume. Primary productivity could be affected by reducing the photosynthetic assimilation of phytoplankton within the affected area. Zooplankton in the immediate vicinity of the turbidity plumes may be adversely impacted by clogging of the filter-feeding mechanisms or blocking respiratory surface.

Other nekton are highly mobile and would probably avoid localized areas of disturbance. Nektonic organisms, especially fish, would be attracted to the submerged rig or platform, especially at night when the rig is well lighted. Observations in the Gulf of Mexico indicate that fish are also attracted to drill cuttings as they settle through the water column. The free-swimming organisms have the ability to evade or swim freely through the plume, and experience has indicated that no serious long-term effects would be experienced by these organisms as a result of oil and gas activity.

Other types of discharges such as engine cooling water or an accidental oil spill, may also affect the pelagic inhabitants. Oil spill impacts are discussed in Section IV.A.4.

b. Impacts on the Benthic Environment

The major impact of oil and gas drilling activity to the benthic environment would be the smothering of sessile invertebrates caused by the discharge of drilling muds and cuttings. Fauna generally recolonize the deposits quickly; however, the post-drilling species may differ from pre-drilling species. On the GOM OCS, about 90% of the discharge settles rapidly, usually within 1,000m (3,300 ft). The cuttings pile may persist or be dispersed depending on the energy of the sea bottom. In addition to the smothering effect, chemical (toxicity) effects might be expected especially among organisms which feed on the substrate. However, most water-based drilling fluids are relatively nontoxic, and their effects are restricted primarily to the immediate vicinity of the drill site (National Research Council, 1983).

Impacts to the benthos resulting from oil spills are discussed in Section IV.A.4.

c. Impacts on Sensitive Underwater Features

The impacts to the sensitive underwater features of the assessment area, the Flower Garden Banks, would be the smothering and toxicity effects resulting from drilling discharges discussed in Section IV.C.2.b. and the destructive effects of anchoring on the sensitive areas. There has been much research (including MMS required monitoring) on the effects of drilling discharges on the Flower Garden Banks. The research was synthesized and summarized by the National Research Council (1983). Shunting has been found to be an effective mitigative measure in areas near topographic highs since the effluent is generally confined to depths greater than where the sensitive organisms lie (Ibid). Water (and the shunted effluent) cannot flow from the base of the Banks to the level of the living reef (Rezak et al., 1981). Anchoring of large vessels on the banks is a serious problem. Anchoring causes the destruction of the organisms and coral boulders along the path of the anchor line. Such effects can be long term and severe.

In order to protect the Flower Garden Banks, the MMS has imposed special protective measures by the attachment of lease stipulations to those blocks leased within the AEA area. The lease stipulation has been modified slightly through the years. Early leases may not contain the stipulation. The requirements of the current stipulation are made conditions of plan approval when the stipulation is not included on a lease or varies from the current stipulation. The current lease stipulation establishes three zones which require mitigation. The no activity zone is defined by the 100m (330 ft) isobaths of the East and West Banks. No oil and gas exploration or production activity, including associated anchoring, is permitted within this zone. The one mile zone requires that the operator shunt all drilling cuttings and fluids to within 10m (33 ft) of the seafloor and requires that a monitoring plan be submitted which assesses the effects of the drilling operations on the appropriate bank. A four mile zone requires that the operator shunt. The four mile zone boundary was established to correspond with the boundary of the proposed Flower Garden Banks National Marine Sanctuary. The Marine Sanctuary as currently proposed encompasses only the no activity zone.

Anchor damage is also prohibited by the rules implementing the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic (50 CFR 638, as amended July 23, 1984) which prohibit the taking of coral at the Flower Gardens. "Taking" is defined as damaging, which would include damage from anchoring.

Monitoring efforts of past oil and gas activities within the AEA area have shown that the stipulations protect the sensitive biota of the banks. Future stipulations may be modified in order to reflect the latest knowledge on the banks and the effects of oil and gas operations on them. Impacts resulting from oil spills are discussed in Section IV.A.4.

3. Impacts on Endangered or Threatened Species

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, a request to reinitiate consultation on the proposed Gulf of Mexico lease sales was sent to FWS and National Marine Fisheries Service on November 10, 1981. The biological opinions from these agencies (Appendix), along with the 1979 opinion, indicate that leasing and exploration activities associated with this area are not likely to jeopardize the continued existence of the listed species considered in the consultations or result in the destruction or adverse modification of their Critical Habitats. However, FWS indicated that consultation must be reinitiated should any additional onshore facilities be established along the Gulf coast. The MMS will decide on a case by case basis whether proposed development and production activity is likely to jeopardize the continued existence of endangered species or result in destruction or adverse modification of critical habitat and therefore would require Section 7 Consultation.

Impacts on threatened and endangered species could result from oil spills, onshore facility construction, or interference with boat or air traffic. Oil spill impacts are discussed in Section IV.A.4. Since no new onshore facilities are expected, no impacts to endangered species or their habitats are expected. Should new onshore construction be proposed, resulting impacts will be discussed in a SEA.

There will be no significant impact to the American alligator or its habitat from oil and gas activities in the AEA area. The Fish and Wildlife

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Service issued a biological opinion that exploration activities will not jeopardize the continued existence of the alligator (Ibid).

Increased support vessel traffic between onshore service bases and offshore drilling sites could result in collisions with turtles. The level of this problem is unknown and requires additional research. Lights on the drilling rig could also attract or disorient marine turtles during their post-natal drive to reach favorable currents. Studies have not been conducted to determine the impact of oil and gas operations on marine turtles and their habitat; therefore, such impacts are difficult to evaluate. Oil and gas activities in the AEA area are not expected to significantly affect the marine turtle species (Ibid).

Collisions between pelicans and support vessels are possible, but such an impact to the endangered species is insignificant. The brown pelican is extremely susceptible to disturbance and habitat alteration of key nesting areas; therefore, it is imperative to prevent disturbance to nesting colonies that could cause nest desertion and egg loss (FWS Biological Opinion, 1979, see Appendix). For this reason, a special protective measure is made a condition of plan approval for those plans whose support transportation may come in proximity to pelican nesting areas. The protective measure requires the operator to be aware and avoid disturbance of the islands in Texas where nesting has occurred: Sundown Island in Matagorda Bay, Long Reef in Aransas County, Second Chain of Islands in San Antonio Bay, and Pelican Island in Nueces County.

Since the whooping crane population is so low, collisions between support aircraft and the cranes could adversely affect the recovery of the species. A special protective measure is included as a condition of plan approval for those plans which use an onshore base in the vicinity of the whooping crane Critical Habitat. This measure requires that the operator prohibit the use of fixed-winged aircraft lower than 500 feet and helicopters lower than 1,000 feet during the period of October 15 through August 15, over areas used by whooping cranes.

The FWS in its biological opinions (Appendix) has determined that oil and gas exploration activities excluding major oil spills and new onsite construction are not likely to jeopardize the continued existence of these bird species or the other endangered/threatened bird species: Attwater prairie chicken, artic peregrine falcon, bald eagle, and red-cockaded woodpecker.

Boat collisions with whales are possible but considered unlikely. Increased marine traffic could disrupt feeding and/or migration behavior, and traffic collisions involving these animals could increase. Data are not available to adequately estimate the impacts which could result from the above described activities; therefore, probable impacts on marine mammals and their habitats cannot be predicted with any degree of reliability. The National Marine Fisheries Service determined that oil and gas exploration and development activities are not likely to effect the continued existence of the endangered/threatened whale species (Ibid).

Barring new onshore facility construction, the impact of OCS drilling and production activities on the red wolf will not be significant (Appendix); nor are impacts expected on ocelots or jagurundis or their habitats.

4. Impacts on Breeding Habitats and Migration Routes

The major impact producing agents which could potentially impact the breeding habits and migration routes of species in the AEA area include OCS

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related oil spills, disturbance from onshore facility construction, and collisions with marine vessels and aircraft. Refer to Section IV.A.4. of this AEA for a discussion of potential oil spill related impacts.

Drilling operations within the AEA area will most likely utilize existing onshore support facilities. If construction of new onshore bases is necessary, it is likely that such construction could impact onshore species. However, because it is assumed that any new construction will take place in well-developed areas and that the activities will be consistent with the state's Coastal Zone Management plan (in Louisiana) and Federal and state regulations and permitting requirements, impacts to coastal species should be sufficiently mitigated.

Increased OCS-related traffic between onshore support bases and offshore drilling sites could result in collisions with marine mammals, turtles, and birds. The current level of such impacts is unknown, and it is difficult to predict to what extent such impacts could increase without additional research. However, it is believed that the current impact level is very low and unlikely to increase substantially as a result of increased activity in the area.

Potential impacts to specific endangered/threatened species are discussed in Section IV.B.4.c. of this AEA.

5. Impacts to Protected Areas of Biological Concern

Impacts to those coastal areas described in Section III.B.5. would be limited to oil spill impacts since these areas would not be available for the construction of onshore activities. Impacts resulting from oil spills to these types of coastal environments are discussed in Section IV.A.4.

MMS permitted oil and gas activities should not be affected by nor should they affect the proposed Flower Gardens National Marine Sanctuary. The boundaries of the proposed sanctuary are the existing boundaries of the MMS no activity zone. The Marine Sanctuary is expected to establish guidelines for prohibiting activities such as anchoring and coral collecting within its boundaries. The MMS already prohibits anchoring of its lessees in the no activity zone through the lease stipulations. The taking of coral may be required in order to complete a monitoring program required by a MMS lease stipulation. The taking of coral except by scientific research (e.g., monitoring) presently is prohibited under 50 CFR 638 as amended July 23, 1984. If after the designation of the Flower Gardens as a National Marine Sanctuary, the taking of coral for scientific research is allowed to continue, MMS required monitoring should not be affected nor would any effects to the Marine Sanctuary as proposed be expected.

C. IMPACTS ON SOCIOECONOMIC CONDITIONS AND CONCERNS

1. Impacts to Economic and Demographic Conditions

Since no new employment is expected as a result of activities in the AEA area, no impacts to economic and demographic conditions are expected. If new employment is proposed, this section would be addressed in an SEA.

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2. Impacts on Land Use

Due to the extent of existing infrastructure, coastal land use is not expected to be impacted. If factors causing impacts to land use are identified in a specific plan, this section would be addressed in an SEA.

3. Impacts of Construction of Onshore Support Facilities

Since no construction of onshore support facilities is expected, no impacts are expected. If new or expanded facilities are proposed, this section would be addressed in an SEA.

4. Impacts of Public Opinion

This section will be addressed in an SEA.

5. Impacts on Navigation

Crew and workboat operations between onshore support bases and offshore rigs will result in increased marine traffic in the assessment area. Increases in traffic could result in congestion in certain areas, and possibly collisions, which could result in personal injury. At night or during rough weather, fog, or heavy seas, ships not using established fairways could collide with an exploratory drilling rig or platform. However, significant impacts to shipping are not expected since no structures are permitted in fairways and offshore structures are required through U.S. Coast Guard regulations (33 CFR 67) to be marked with navigational lights. The temporary nature of the drilling rigs and the platform removal requirements also mitigate potential impacts to shipping. As a positive impact, offshore structures may serve as navigational aids due to the marking requirements in OCS Order No. 1 (30 CFR 250.37) and areas of safety for small boat operators during storms.

6. Impacts Concerning Military Use

The military warning area W-602 is used by the Department of Defense for conducting military training, testing and research activities. The nature of military operations dictate that some oil and gas activity may have to be delayed on some occasions. In order to promote a compatible joint usage of an area, negotiations between the Department of the Interior and the Department of Defense have resulted in established procedures to resolve all conflicts prior to any offshore activity. As part of the mitigating measures required for oil and gas activities, a stipulation is attached to leases within the warning area. The stipulation contains a liability disclaimer and requires operators to control their electromagnetic emissions so as not to interfere with Defense activities. The stipulation also requires that the operator enter into an agreement with Offutt Air Force Base, Nebraska, concerning the coordination of boat and air traffic into the warning area. The address for contact is: Director of Training, Deputy Chief of Staff, Operations Headquarters Strategic Air Command, Offutt AFB, Nebraska 68113. The coordination requirement of this stipulation would be made a condition of plan approval for operations in any leases which are located within the W-602 area but which may have been leased without the stipulation. The imposition of the terms of the stipulation

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should effectively mitigate any impacts which could result from military use of the area.

7. Impacts on Commercial Fishing

The potential adverse impacts to the commercial fisheries resources from future oil and gas activities could be physical damage to the organisms and their habitats due to drilling, anchoring, smothering by drilling fluids and/or cuttings, and toxicity to the organisms from the drilling fluids' components. While the impacts from these activities are generally quite localized in extent, the damage caused by these activities to unique and productive communities, such as coral reefs, may be severe.

The major environmental consequences and impacts on commercial fishing would be from drilling rigs and gear conflicts. Drilling rigs remove from 1-2 hectares (3-5 acres) of trawling space. Gear conflicts result in such losses as trawls, shrimp catch, business down time, and vessel damage. The financial losses from gear conflicts are theoretically covered by the Fishermen's Contingency Fund; however, only about ½ of the claims submitted for payment for damages on the OCS Gulfwide since inception of this funds in February 1980, have been settled. Therefore, the fishermen are absorbing some economic loss from this impact producing factor.

Commercial fishery resources could also be adversely affected by the discharge of drilling muds. Drilling muds may contain materials toxic to marine fishes; however, dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column reached background level at a distance of 2,000m (6,562 ft) [probably within 1,000m (3,281 ft)] of the discharge point (Ecomar, Inc., 1980). The construction of navigation channels and onshore support facilities may alter salinity regimes and water current patterns and contribute to wetland/seagrass loss which in turn could have a negative impact on the fishery resources. Oil spill impacts to commercial fishing are addressed in Section IV.A.4. Refer to Section IV.C.8. of this AEA for a discussion of the beneficial impacts from drilling activity on recreational fishing.

8. Impacts on Recreation/Tourism

Potential impacts to recreational resources at the Flower Garden Banks and in the adjacent AEA coastal area from oil and gas activity are largely limited to oil spills. The level of shoreline recreational use is expected to be unaffected unless obvious and extensive oil pollutants impact the shoreline. Oil spill impacts to recreational resources, activities, and tourism are discussed in Section IV.A.4. of this AEA.

The aesthetics of the AEA coastal area utilized for recreation by both tourists and residents would not be affected by activities in the AEA offshore area since the activities would not be visible from the shore. Impacts to a few shoreline recreational areas could result from trash, debris, noise, and wakes from oil and gas related transportation support needs such as crew boats, supply boats, and helicopters. Expanded and continuous development in the central and western Gulf is contributing to serious chronic debris wash-up problems at some shorefront parks in Louisiana and Texas (USDI, BLM, 1980). Increased crew boat traffic could possibly contribute to marsh loss within the

AEA coastal area. Continued marsh loss and wetland deterioration would consequently cause waterfowl, hunting, and fishing opportunities to decline (USDI, BLM, 1981).

The aesthetics of the AEA offshore area utilized by recreationists (i.e., divers, sport fishermen) may be affected by the presence of visible lease site activities. However, the presence of these oil and gas structures could also offer these visitors to the Flower Garden Banks positive impacts by serving as navigational aids to the site and by offering refuge and emergency assistance to boats in distress. In addition, positive impacts to fishing opportunities are brought about through oil and gas development in that oil and gas structures are known to attract fish and inevitably fishermen. Many of the fish species that congregate around petroleum structures are prime sport fishing targets (snapper, grouper, mackerals, cobia, etc.); moreover, it is possible to predict the location of desired species by associating drilling platforms with major depth zones. Studies have determined that oil and gas structures are the most popular offshore fishing locations for private and charter boat fishermen in portions of the western and central Gulf (USDI, MMS, 1983b).

Anchoring in the vicinity of the Flower Garden Banks could cause long lasting visible scars on the Banks which would detract from the Bank's aesthetic appeal for divers. Anchor damage has been determined to be the single most serious threat to benthic areas resulting from oil and gas activities. However, the establishment of the "No Activity Zone" for the Flower Garden Banks (Figure A) completely eliminates the threat of anchor damage to these Banks from oil and gas activities. The anchoring of other vessels, such as fishing boats, cannot be regulated by MMS (USDI, MMS, 1984b). However, regulations for the implementation of the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic (50 CRF 638, as amended July 23, 1984) do restrict damage to coral (including anchoring) and certain fishing methods at the Flower Gardens.

9. Impacts on Cultural Resources

No evidences of known or potential cultural resources exist in the AEA area; therefore, no impacts to offshore cultural resources are expected. If existing onshore support facilities are utilized as expected, no impacts to onshore cultural resources would be anticipated. Stipulations attached to leases after December 30, 1973 (Sale 32), provide further safeguards for the protection of presently unknown cultural resources. The operator is required to report, upon discovery of any site, structure or object of historical or archaeological significance, to the RM, MMS and to make every reasonable effort to preserve and protect that cultural resource. Should evidence of cultural resources be discovered offshore or during any onshore construction, this section will be supplemented in an SEA.

10. Impacts on Other Commercial Uses

There are no other commercial uses in the area to be affected by oil and gas exploration activities.

11. Impacts on Other Mineral Uses

At present, there are no further plans or proposals for the mining of mineral resources other than oil and gas in the AEA area; therefore, no conflict of use is expected to result.

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12. Impacts Concerning Pipelines and Cables

Offshore oil and gas pipelines are considered impact-producing factors of special concern on the basis of potential space/use conflicts, disturbance of bottom sediments, accidental oil spills, and other environmental perturbations. Impacts of pipeline installation are fully discussed in the Regional Environmental Assessment, Gulf of Mexico Pipeline Activities (USDI, MMS, 1983c). Impacts resulting from a specifically proposed pipeline would be discussed in an SEA and CER.

Since there are no cables in the AEA area, no impacts concerning cables are expected.

13. Impacts of Ocean Dumping

The sole EPA-approved deep water disposal area in the Gulf of Mexico is located 89km (55 mi) due south of the AEA area. At the time of this writing, the MMS does not anticipate that any permitting agency will issue permits for dump sites in or adjacent to the AEA area. Therefore, it is unlikely that impacts associated with ocean dumping will affect or be affected by oil and gas activities within the AEA area.

D. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Localized and short-termed impacts would be expected to result from oil and gas activity in the AEA area. Most of these impacts would not be considered to be irreversible.

Ambient air quality in the vicinity of a drilling rig would be degraded by operation-induced emissions. Although emissions, in varying quantities at intermittent intervals, could be generated during drilling operations, the extent of the area affected would be localized since the prevailing climatic conditions would dilute and disperse the pollutants. Non-combustible gas blowouts and combustible oil blowouts could also adversely affect the air quality in the vicinity of the drilling operations, with the degree of air quality degradation being determined by the quantity of pollutants emitted, the duration of the blowout, and the prevailing climatic conditions. The minor emissions produced by marine vessels and helicopters should not have any significant effect on the onshore air quality.

Rig, platform, and pipeline installation and the discharge of drill cuttings and muds may alter or degrade the water quality by resuspension of sediments and the release of entrapped pollutants into the water column. Normally, these activities have localized effects with short-termed persistency because of the dilution effects of a water body the size of the Gulf of Mexico. Discharges of treated liquid waste and concentrated seawater would also be rapidly diluted to background levels; therefore, no significant water quality degradation is expected to result from exploration and production activity.

Bottom disturbances and turbidity plumes induced by installations of rigs, platforms, and pipelines and the discharge of drill cuttings and muds should have localized short-termed effects on marine organisms. Benthic communities occupying disturbed areas would suffer direct and indirect mortality. Long-term effects would only result from introduction of material differing in chemical and physical makeup which could alter the composition of the recolonized benthic community. The turbidity plumes induced by the various activities could reduce the photosynthetic assimilation of the phytoplankton populations inhabiting the area. Zooplankton may be adversely impacted by

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clogging of the filter feeding mechanisms or by blocking the respiratory surfaces. Plankton populations would be subjected to intermittent losses in the vicinity of a drilling site during drilling. Since a proposed drilling action is a short-term activity with localized effects, no significant long-term losses of marine resources would be expected.

The proposed drilling and production activity has the potential to induce a conflict of uses for the area involved. The area occupied by a rig, 1-2 hectares (2-5 acres), and platform, approximately 50 hectares (124 acres), would be unavailable for trawling operations for the duration of drilling at one well site. Although this is recognized as an adverse impact, the degree and extent of the effect is unknown. There are no data available to indicate that OCS oil and gas operations are responsible for declines in catches. There also exists a potential of boat collisions with a drilling rig; however, this is unquantifiable.

V. CONSULTATION AND COORDINATION

This section will be addressed in an SEA.

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VIII. APPENDICES

A - FWS/Biological Opinion for the Lease and Exploration of Outer Continental Shelf Lands in the Gulf of Mexico Region

B - National Oceanic and Atmospheric Administration

C - National Marine Fisheries Service

D - FWS/Biological Opinion Regarding Oil and Gas Leasing and Exploration Activities in the Gulf of Mexico

E - Section 7 Consultation - Proposed Exploration Plans for OCS in Gulf of Mexico

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES MMS-82-1

OCT 25 1982

MEMORANDUM

To: Director, Minerals Management Service

From: Chief, Office of Endangered Species

Subject: Amended Biological Opinion for the Lease and Exploration of Outer Continental Shelf Lands in the Gulf of Mexico Region

By memorandum received November 10, 1981, the Bureau of Land Management (BLM) and the Geological Survey (GS), now a part of the Minerals Management Service (MMS), requested the reinitiation of formal consultation with the U.S. Fish and Wildlife Service (FWS) under Section 7(a) of the Endangered Species Act to consider all of the operations pertaining to Outer Continental Shelf (OCS) oil and gas leasing and exploration in the Gulf of Mexico OCS Planning Area.

An original Section 7 consultation on the lease and exploration of OCS lands in this area occurred in 1979 with a biological opinion being rendered to BLM and GS April 10, 1979 (copy attached). Consultation was reinitiated on the basis of an extension of the boundaries of the Gulf Region as well as on an oilspill analysis for the Region.

A consultation team consisting of Wayne Milstead, Office of Endangered Species (OES), Team Leader; Bob Cooke, FWS, Region 4 Office, Atlanta, Georgia; and Jim Barkuloo, FWS, Panama City, Florida, was appointed and attended a meeting with representatives of MMS in New Orleans on December 2-3, 1981. The consultation team requested information on any new potential onshore facilities in the Region and an analysis of the probability of oilspills occurring as a result of the action. Since the information was not forthcoming and the 90-day period for consultation had run out, a memorandum was sent to MMS on March 4, 1982, requesting that formal consultation be delayed until the information requested was made available. On March 13, 1982, the information requested was received from MMS, but as a result of subsequent conversations with MMS personnel it was discovered that the oilspill analysis had been revised. Final, up-to-date oilspill information was received in OES on April 13, 1982, at which time the formal consultation period was resumed.

[Following submission of a biological opinion on June 30, 1982, the FWS felt that new information received on the potential impacts of this project on listed species was sufficient to necessitate a revision, resulting in this amended version.]

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The following listed Endangered or Threatened species were considered during this consultation as being potentially affected by the action: bald eagle (Haliaeetus leucocephalus), brown pelican (Pelecanus occidentalis), loggerhead sea turtle (Caretta caretta), Kemp's (=Atlantic) Ridley sea turtle (Lepidochelys kempii), West Indian (Florida) manatee (Trichechus manatus) and its Critical Habitat, [American crocodile (Crocodylus acutus) and its Critical Habitat,] and whooping crane (Grus americana) and its Critical Habitat. [The status of other species included in the April 10, 1979, biological opinion has not changed substantially. The extension of the lease area and the oilspill risk analysis will not result in changes in the 1979 opinion for these species.]

The Gulf area involved in this consultation includes the outer continental shelf lands not presently under lease that are north of a line running east from approximately the U.S.-Mexican border on the coast at 26 degrees north latitude to 88 degrees west longitude where it jogs north 1 degree latitude, then east again 2 degrees west longitude to 86 degrees west longitude with another diversion south 2 degrees latitude to 25 degrees north latitude and finally east toward the Florida coast until a final jog north along 82 west degrees longitude intersects the Florida coast just south of Charlotte Harbor (Figure 1). This consultation considers the effect of all activities associated with the lease and exploration of lands within this area on listed Endangered and Threatened species under the jurisdiction of the FWS.

[A major change which brought about the reinitiation of the previous consultation was the addition of a "frontier" lease area off southwest Florida between 26 degrees and 25 degrees north latitude. In addition, new information on Gulf-wide OCS activities was provided in the form of an oilspill risk analysis for the development/production phase in the region. This opinion, therefore, concentrates on those species which are within or adjacent to this "frontier" area. Comments will generally reference the previous biological opinion of April 10, 1979, and the statements in that opinion stand unless new information necessitates additional comment or allows a change in any part of that opinion.]

Exploration of the OCS requires certain onshore facilities that might include office space, helicopter and fixed-wing aircraft facilities, boat docks, and support bases. There is an extensive history of intensive oil and gas activity in the Gulf of Mexico, and numerous onshore facilities have been established throughout the Region. The availability and necessity of onshore facilities appears to remain as they were at the time of our April 10, 1979, biological opinion, and it would seem unlikely that additional lease and exploration of the OCS in the Gulf Region will result in the development of additional onshore support facilities. Should the use of existing facilities be changed or additional onshore facilities be needed which may affect listed species or their habitats, consultation must be reinitiated.

Although not available for the 1979 consultation, an oilspill risk analysis has been provided for this reinitiation. It gives the percent probability that one or more spills of 1000 barrels or more will occur, from a variety of sources, during the life of the project and that they will strike various targets and/or land segments along the Gulf Coast within 3, 10, or 30 days after initiation of the spill. This analysis is based on activities that can be expected to be associated with the development and production phases of the project following lease and exploration, and this consultation is on the lease and exploration phases only. Probabilities are broken down into spills expected to result from three cumulative categories of events: (1) the proposed lease sale only, (2) the proposed sale plus existing leased OCS lands, and (3) the proposed sale plus existing leased lands, as well as oil imports moving through the lease area. The life of the proposal is considered to be 40 years. If the third category of events leading to oilspills that will strike various targets within 30 days (proposed sale, existing activities, and imported oil) is considered the worst case situation, some figures are very high. This is particularly true of land segments in the western Gulf where probabilities from the proposed lease alone are from 13 percent at Aransas County, Texas (whooping crane wintering range), to 67 percent at Saint Bernard Parish, Louisiana (a brown pelican nesting site); and if existing leased lands plus imported oil are included, these figures increase respectively to 51 percent and 93 percent.

Although the general statements and considerations provided for each species in the 1979 biological opinion are still appropriate, [the addition of a "frontier" area and] the introduction of oilspill data necessitates an additional consideration of potential impacts on some species. [The West Indian manatee, American crocodile, brown pelican, and loggerhead sea turtle are the species most likely to be impacted as a result of the extended lease area. Other limited species are considered here because of the potential for impacts as oil and gas activities increase throughout the Region.]

Bald Eagle (*Haliaeetus leucocephalus*)

The discussion in the 1979 biological opinion regarding the possible contamination of the bald eagle's food source by an oilspill is emphasized by the high probabilities of such spills reaching segments of the Texas and Louisiana coast in reasonable proximity to bald eagle nesting territories. It can be expected that bald eagles might be attracted to the area of a spill by dead and dying fish and birds as a food source and thereby consume oil adhering to prey species. Nevertheless, evidence from other species of birds suggests that adult birds may be able to tolerate the ingestion of fairly high concentrations of crude oil. Also, the direct effect of oil on plumage is perhaps not as significant a factor with bald eagles since adults, at least, tend to have minimal contact with the water from which they are taking prey.

However, the more important adverse impact of an oilspill on bald eagles would probably be on reproduction through contamination of eggs from adults carrying oil on breast feathers and feet.

Nesting territories are found in or near Refugio (land segment 6), Calhoun (land segment 7), Matagorda (land segment 8), and Brazoria (land segment 9) Counties, Texas, and the relatively high probabilities of oilspills striking these areas (13 percent, 24 percent, 45 percent, and 32 percent respectively) are of concern. Similarly, active bald eagle nesting in the Mississippi delta region of Louisiaña from land segments 16 to 21, along with associated oilspill probabilities of 54 percent, 40 percent, 17 percent, 86 percent, 67 percent, and 31 percent respectively suggests a high level of threat to the recoverability of the species in the western Gulf Region. [The status of this species in the eastern and central Gulf Regions is essentially the same as discussed in the 1979 biological opinion.]

Brown Pelican (Pelecanus occidentalis)

Few brown pelican nesting sites remain in the western Gulf of Mexico. Three sites exist along the Texas coast, Pelican Island, Nueces County (land segment 5), and Second Chain of Island and Sundown Island, Calhoun County (land segment 7). Also, pelicans range over much of the Texas coast from land segment 4 (Kleberg County) north to land segment 8 (Matagorda County). Probabilities of oilspills resulting from the proposed sale striking land segments 5, 6, and 7 are 22 percent, 13 percent, and 24 percent respectively. These figures are increased to 44 percent, 51 percent, and 61 percent when oil from existing leased OCS lands and oil imports are included as a factor.

In Louisiana, only two small restored nesting colonies exist, one on Queen Bess Island, Jefferson Parish (land segment 18) and the other on North Island, Saint Bernard Parish (land segment 20). The probability of oilspills from the proposed lease activity striking these two segments is 17 percent and 67 percent respectively.

When the effects of existing leased OCS lands and imported oil is included, these probabilities increase to 69 percent and 93 percent. Such high values nearly assure that one or both of these two fragile nesting sites will be affected by one or more oilspills of 1000 barrels or more within 30 days after release over the 40 years of the project. Even though all these island nesting sites in Texas, as well as in Louisiana, might be partially protected from the direct impact of an oilspill in the open Gulf by seaward barrier islands, the wide-ranging nature of the birds when foraging would amplify the possibility of oil contamination. The most damaging effect of oil contamination on brown pelicans would be on reproduction. Due to the bird's feeding habits, it is reasonable to assume that adult brown pelicans might in fact avoid feeding in oiled waters because of the difficulty of their observing fish beneath the surface. But very small amounts of certain crude and refined oils applied to the surface of eggs cause high embryonic mortality or morphological abnormalities in a variety of avian species. If spills occurred during the nesting season of the brown pelican, oil can be transferred to eggs from feathers or feet of adults resulting in reduction in hatching rate. As with bald eagles, the impact of oilspills on the recoverability of brown pelicans in the Texas-Louisiana coastal region could be substantial. [The status of the brown pelican in the eastern Gulf Region is essentially the same as discussed in the 1979 biological opinion.]

Whooping Crane (Grus americana)

The wintering range of the entire reproducing wild population of the whooping crane exists along a stretch of Texas coast, including a portion of the Critical Habitat (Aransas, Calhoun, and Matagorda Counties), subject to probabilities of being impacted by one or more substantial oilspills of 13 percent, 24 percent, and 45 percent during the life of the proposed lease of these OCS lands. These figures increase to 51 percent, 61 percent, and 86 percent when activities on existing leased lands plus imported oil are added to the oilspill analysis.

These birds feed largely on crabs and clams in tidal flats and shallow bays and channels while wading, and oiled waters in these habitats could pose a considerable threat if a spill occurred between November and late April when the

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cranes are on their wintering grounds. Again, as with brown pelican nesting sites, this wintering habitat of whooping cranes is protected to some extent from oilspills in the open Gulf by barrier islands, but the loss of even a relatively small portion of a population, estimated to consist of approximately 75 individuals, could have a drastic impact on the continued existence of the species.

Sea Turtles

[Recent studies on the effects of petroleum on the development and survival of marine turtle embryos are inconclusive. The results of these studies indicate that oil remaining on the beach approximately one year after a spill did not cause significant mortality in sea turtle eggs, however, fresh crude oil deposited on top of sand can cause extensive mortality to incubating sea turtle eggs. More definitive information is needed to assess impacts of oiling on sea turtle nesting beaches.]

Loggerhead Sea Turtle - (Caretta caretta)

Loggerhead sea turtles nest on several barrier islands along the Gulf coast, in some cases in considerable numbers. The probabilities of an oilspill from all potential sources striking some areas of known loggerhead nesting sites within 30 days are relatively high. For instance, the figures for the Chandeleur Islands, Louisiana (segment 20), has a probability from all sources of 93 percent and Santa Rosa Island, Florida (segment 24), has a probability of 36 percent. [The probability of oil reaching nesting beaches in the "frontier" lease area off Florida as a result of OCS leasing and exploration is near zero.]

Kemp's (=Atlantic) Ridley Sea Turtle - (Lepidochelys kempii)

Except for purported occassional nestings along the southern Texas coast, this species nests entirely along an approximately 14-mile stretch of Mexican coast.

Since 1978, the U.S. Fish and Wildlife Service has been involved in a project designed to return these turtles to nesting sites in the U.S. Eggs are collected in Mexico, transported to Padre Island National Seashore, and placed in artificial nests. After hatchlings move from these nests into the water, they are recaptured and raised in "head start" facilities until they are mature enough to be released into the Gulf. It is hoped that this procedure will result in turtles that are imprinted on Padre Island as a nesting site, and that they will return there when sexually mature at approximately 7 years of age. [The impacts of a fresh oilspill on nesting stages of the species would probably be significant if the oil hit the beaches during the nesting season.] The probability of a 1000 barrel or more oilspill striking some part of Padre Island within 30 days of its inception from the proposed sale only ranges from 5 percent to 19 percent, and when present activities are added these climb to 8 percent to 33 percent. Such probability figures are high enough to warrant concern.

West Indian (Florida) Manatee - (Trichechus manatus)

The manatee is confined to shallow coastal waters, bays, rivers, and inlets along both coasts of Florida, portions of which are designated as Critical Habitat. The probabilities of one or more oilspills of 1000 barrels or more occurring and striking coastal areas within the range of the manatee on the west coast of Florida within 30 days of release is 6 percent. For any one land segment in manatee range, the highest probability, 3 percent, is found adjacent to the Tampa Bay area. On the basis of this information, it would appear that oiling should not pose much of a threat to the manatee.

Boat traffic has been and remains a major threat to the species, and this was the primary topic of concern in the biological opinion of 1979. In this case, the potential hazard from boat traffic would of course derive from any additional boating activities associated with the lease and subsequent exploration for petroleum in the Gulf OCS.

[American crocodile (Crocodylus acutus)

The extension of the OCS lease area south to 25 degrees north latitude offshore Florida increases the potential for disturbance and impact on the crocodile. The lower Keys population within the National Key Deer Refuge would be within 20 nautical miles of the nearest lease tract offered. The nearest documented nesting population to the lease areas is located within Everglades National Park, approximately 30 nautical miles from the nearest lease tract. The oilspill risk analysis shows a 1 percent probability of oil reaching land in land segment 43 within 30 days, but the probability of it reaching Everglades National Park was less than 0.5 percent. Since the possibility of an oilspill is even less during exploration, and no new onshore facilities are anticipated, the April 10, 1979, biological opinion for the American crocodile is still valid. This includes the provision that "any development/production activities in or near the Cape Sable/Florida Bay area will require Section 7 consultation. At that time, further information will be necessary to determine the effect on the American crocodile. This information should include site specific transportation methods to be used, location of all onshore facilities associated with OCS activities, an oilspill trajectory study including current direction/velocity information, and other pertinent information." Although an oilspill risk analysis is now available, there may be a need for more site specific or refined information on oilspill trajectories in case of development/production.]

Conclusion, Advisory Statement, and Cumulative Effects

There are two areas of concern when considering potential affects of leasing and exploring OCS lands in the Gulf of Mexico on Endangered or Threatened species. One is the development of onshore facilities that are either support bases directly associated with exploration activities or marine terminals, refineries, gas processing plants, pipelines, etc. that are associated with subsequent development and production activities. Second is the chance that, if discoveries are sufficient and production occurs, oilspills of significant size may occur and impact listed species and/or their habitats.

In your memorandum of March 11, 1982, you stated that the existing support base at Port Manatee, Florida, is the most likely one to be used, but there is a 5 percent to 10 percent probability that Boca Grande or Key West, Florida, could be used as support bases. We take this to mean that no new support bases will be required for exploration activities resulting from the lease of OCS lands in the Gulf Region covered by this consultation, with the exception of the slight chance that Boca Grande and Key West might be used. Furthermore, it is assumed that all other types of facilities mentioned in this memorandum will be required only if development and production result from exploration in this Region.

It is also understood that the oilspill analysis provided for this consultation pertains only to the development and production phases on lands to be leased in the Region, plus the background of existing production along with the contributory effect of oil imported into the Gulf of Mexico. Therefore, as long as leasing and exploration activities utilize only existing onshore support facilities in the Gulf Region (not to include the use of Boca Grande and Key West, Florida), and as long as the probability of oilspills (of a magnitude large enough to be included in the oilspill analysis) occurring during the exploration phase is essentially zero, then it is my biological opinion that these activities are not likely to jeopardize the continued existence of the bald eagle, the brown pelican, the whooping crane, the loggerhead sea turtle, the Kemp's (=Atlantic) Ridley sea turtle, [the American crocodile,] and the West Indian (Florida) manatee or result in the destruction or adverse modification of the Critical Habitat of the whooping crane, [the American crocodile,] and the Florida manatee. However, should any additional onshore facilities be established along the Gulf Coast in support of exploration activities, particularly south of Tampa Bay, Florida (Port Manatee), then formal Section 7 consultation must be reinitiated. Such a request for consultation must include the following information:

(a) Location of the port to be used for operation;

(b) Routes or channels to be used by the vessels or aircraft and the relationships between these routes and listed species habitat or migration routes;

(c) Description of vessels to be used for support of OCS operations (design, speed, draft, and other pertinent information);

(d) Determinations of whether the vessels used for OCS oil and gas operations would have characteristics which would be more detrimental to manatees than those currently used in manatee habitat.

[(e) Refinement and update of oilspill risk analysis, with emphasis on southwest Florida.]

Even though the probability of one or more oilspills occurring and striking the southwest Florida coast is very small, our concern over the fragile nature of the Florida Bay area expressed in our April 1979 biological opinion continues. In this regard, we reiterate our statement about consulting on the establishment of any support bases along the coast south of Tampa Bay, Florida. We also advise extreme caution when considering any development plans that might feasibly contribute to an increased danger of oilspills in this south Florida area.

We also strongly recommend an investigation into the possible fate of oil from a spill once it is carried out of the Gulf around the southern tip of Florida by the Loop Current. Depending on the location of a spill and the existence and combination of wind and sea currents, it seems possible that oil from the Gulf might end up being deposited on the east coast of Florida under certain conditions.

In this opinion we have endeavored to address the direct (leasing and exploration of OCS lands) and indirect (oilspills and support facilities resulting from exploration) effects of the action as well as the interrelated (development and production phases, along with potential oilspills of the OCS program) and interdependent (pipelines, marine terminals, refinery, gas processing facilities, etc. that could result from development and production) aspects of the action. We have concluded that the direct and indirect actions are not likely to jeopardize the continued existence of the above listed species or result in the destruction or adverse modification of their Critical Habitats if the probability of oilspills from exploration are considered to be near zero and as long as existing support bases are sufficient to handle anticipated exploration activities. Consultation must be reinitiated if indirect actions (especially a need for new support bases) change or, if the interrelated and interdependent activities of development and production commence.

There remains for consideration, the cumulative effects of State and private actions in the Gulf Region that are reasonably certain to occur prior to completion of the Federal action which is the subject of this consultation. Since no specific information on such actions has been provided us by the Federal action agency to date, we reserve the right to make a supplementary comment on the potential effects of these projects (cumulative effects) after receiving a copy of the draft Environmental Impact Statement on this project.

The Minerals Management Service is reminded that Section 7 consultation must be reinitiated if new information reveals impacts on listed species or their habitats from this Federal project that were not considered in this opinion, if the proposed project is subsequently modified, or if a new species is listed or Critical Habitat is designated which may be affected by the proposed actions.

Attachment

Reference

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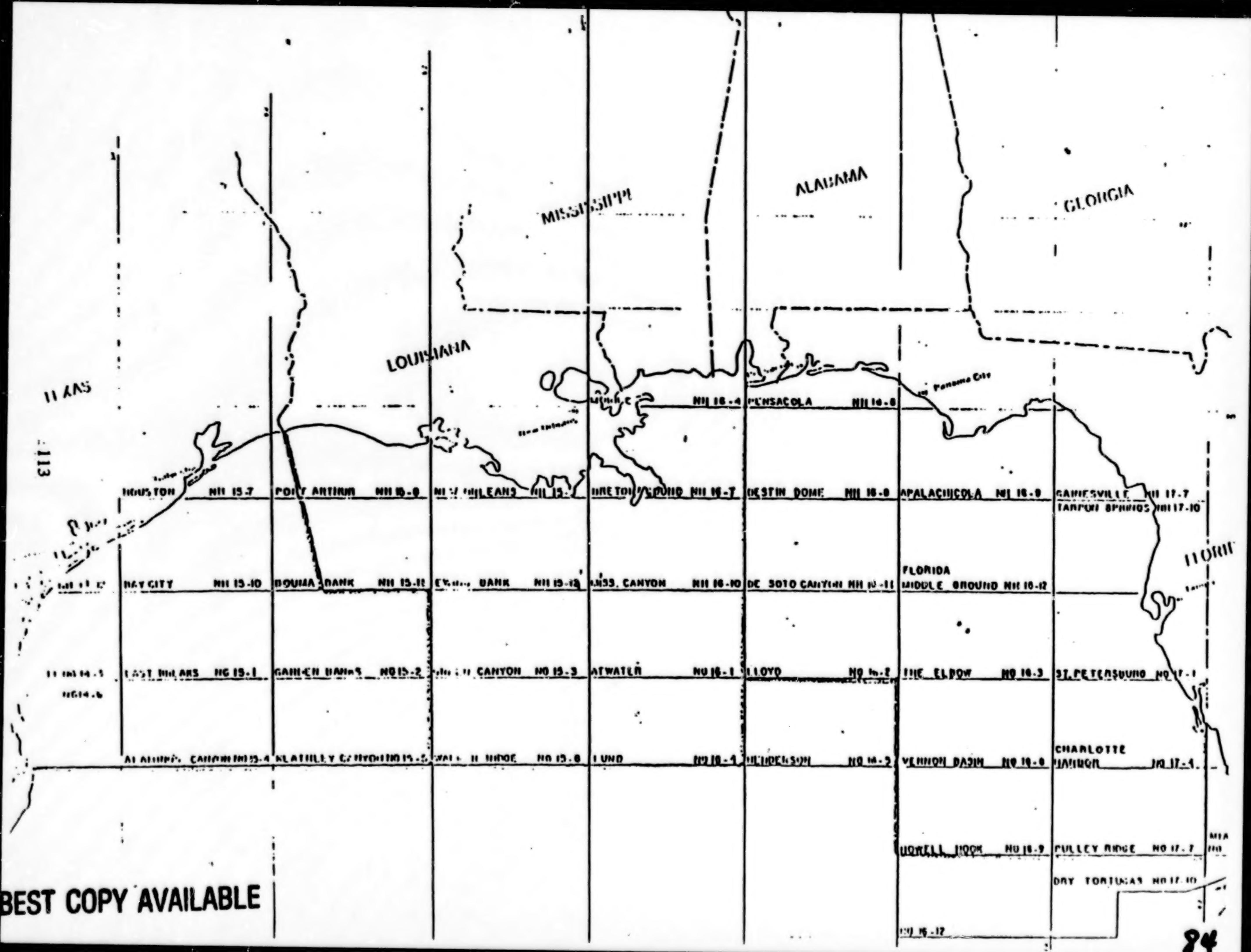

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Region
9450 Koger Boulevard
St. Petersburg, FL 33702

January 15, 1982 F/SER61:AM

Mr. John L. Rankin
Manager, Bureau of Land Management
New Orleans Outer Continental Shelf Office
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, LA 70130-3373

Dear Mr. Rankin:

This responds to your December 21, 1981, letter requesting reinitiation of the Gulf of Mexico Regional Endangered Species Section 7 Consultation.

We have reviewed the information you sent. The material does not provide information that would alter the biological opinion we provided by letter of March 29, 1979, for oil and gas leasing in the entire Gulf of Mexico Outer Continental Shelf (OCS) oil and gas leasing areas. Accordingly, our March 29 opinion (copy enclosed) continues to apply.

Sincerely yours,

D. R. Ekberg
Chief, Environmental and
Technical Services Division

Enclosure

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NATIONAL MARINE
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FILE

MAR 29 1979

Mr. Donald P. Truesdell
Deputy Assistant Director
Department of the Interior
Bureau of Land Management
Washington, D.C. 20240

Dear Mr. Truesdell:

This letter is in response to your November 28, 1978, request for a formal consultation and to the January 30, 1979, request from Mr. J. R. Balsley, U.S. Geological Survey, for a joint consultation pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), as amended, regarding endangered and threatened whales and turtles in the entire Gulf of Mexico Outer Continental Shelf (OCS) oil and gas leasing areas. Enclosed is the biological opinion resulting from the consultation which states that the identified activities are not likely to jeopardize the continued existence of endangered and threatened species or result in the destruction or adverse modification of habitat critical to them.

The Bureau of Land Management should reinitiate consultation if new information becomes available on possible impacts of the proposed activities on endangered or threatened species or their habitats, if modifications are made in these activities, or if a new species is listed which may be affected by these activities.

We look forward to continued cooperation in future consultations.

Sincerely yours,

for Terry L. Leitzell
Assistant Administrator
for Fisheries

Enclosure

bcc: USGS-Balsley
cc: F, GCF, FSE, SWFC, FAK, NWAFC, FSW-Edmondsen, F6-Aron, GCF
(all w/enclosure)
F6:TRLoughlin:634-7461:3/20/79:pvt

10/4/79 - Copy of Sec. 7 Threshold Examin. sent to [illegible], FSE 612.

ENDANGERED SPECIES ACT

Section 7 Consultation - Threshold Examination

Agencies: Bureau of Land Management (BLM) and U.S. Geological Surevey (USGS)

Activity: Gulf of Mexico lease sales, exploration, transportation, termination, development and production.

Consultation Conducted by: National Marine Fisheries Service.

Results of Threshold Examination:

Under Section 7 of the Endangered Species Act of 1973 (the "Act"), as amended, each Federal agency must ensure that any action authorized, funded, or carried out by such agency does not jeopardize an endangered or threatened species. Under the Section 7 consultation process established by the Act, the Secretary of Commerce is required to provide the Federal agency concerned an opinion detailing how the proposed agency action affects any threatened or endangered species within the Department's jurisdiction or the critical habitat of such species. In addition, the Secretary must suggest reasonable and prudent alternatives which would avoid jeopardizing the continued existence of such species or adversely modifying its critical habitat and which can be undertaken by the agency in implementing its action.

By letter of November 28, 1978, the Bureau of Land Management, Department of the Interior, requested initiation of a regional Section 7 consultation with the National Marine Fisheries Service on the Outer Continental Shelf oil and gas leasing program in the Gulf of Mexico.

As part of the consultation process, a meeting was held in New Orleans, Louisiana, on February 9, 1979 with representatives of the Bureau of Land Management, the U.S. Geological Survey, and the National Marine Fisheries Service.

Formal consultation was requested for the following species:

Humpback whale	Megaptera novaeangliae
Right whale	Eubalaena glacialis
Sei whale	Balaenoptera borealis
Blue whale	Balaenoptera musculus
Finback whale	Balaenoptera physalus
Sperm whale	Physeter catodon
Leatherback turtle	Dermochelys coriacea
Hawksbill turtle	Eretmochelys imbricata

Kemp's Ridley turtle	*Lepidochelys kempii*
Green turtle	*Chelonia mydas*
Loggerhead turtle	*Caretta caretta*

Eastern Gulf of Mexico:

These Federal actions involve the offering of 116 tracts for leasing for the extraction of oil and gas. The tracts are located on the Outer Continental Shelf in areas located west, south, and east of that portion of the states of Florida, Alabama, Mississippi, and Louisiana that border on the Gulf of Mexico. The largest portion of the proposed lease offering is located off the coast of Florida.

With two exceptions, each tract contains 5,760 acres (2331.04 hectares). Tract 65-32 contains 5454.72 acres and Tract 65-71 contains 5134.56 acres.

The total area offered in all tracts amounts to 667,229.28 acres (270,023.99 hectares). The tracts are located between 10 statute miles (16 kilometers) to 119 statute miles (190 kilometers) from shore. The water depths range from 60 feet (18 meters) to 1,150 feet (350 meters). Thirty-three of the tracts are located in areas where the water depth is equal to or greater than 200 meters.

Seventy-five of the tracts proposed for offering are believed to have potential for oil and gas production, and the remaining 41 tracts are believed to be potentially oil productive.

No commercial oil and gas production has been found on the Outer Continental Shelf in this region and no marine oil and gas production has been established in this portion of the Gulf of Mexico; therefore, no facilities for the production and transportation of crude and natural gas have been installed on the Outer Continental Shelf in the vicinity of the tracts proposed for leasing.

The U.S. Geological Survey estimates that between 15 and 150 million barrels of oil and 20 - 175 billion cubic feet of natural gas may be produced as a result of this proposed sale. The production rates may be estimated at between 2,500 and 24,000 barrels of oil per day and between 4 and 32 million cubic feet of gas per day. The daily rates are estimated as rates applicable to when development is complete and production stabilizes.

A. Exploration:

Following the awarding of leases, the successful bidders can be expected to drill exploratory wells in order to locate and delineate the areal extent of oil and gas deposits. The most likely number of exploratory wells to be drilled would be 75. These wells will probably be drilled by moveable offshore drilling units.

B. Development and Production:

After the completion of exploratory drilling, platforms would be designed, constructed, and placed in position. Development wells will be drilled from platforms. The most likely number of platforms to be installed is 25, and the most likely number of development wells is 225. Underwater completions may also be utilized. Support facilities for this activity could be located in the Tampa, Panama City, or Mobile areas. The expected production life is 25 years.

C. Transportation:

The most likely method of transportation that will result from the proposed sale will be pipeline transportation of natural gas to shore points in the vicinity of existing onshore natural gas pipelines.

The most likely system for the transport of crude oil would be pipeline transport to onshore storage facilities and transportation from these terminals to existing refineries by surface marine transport. The most likely pipeline mileage that may be installed is 700 miles. Probable destination points and locations of oil terminal facilities and gas processing plants are the Manatee/Tampa area and the Mobile/Pensacola area.

A possible alternative gathering and transportation system could include the provision of offshore storage on the OCS and direct transportation from these facilities to existing refineries.

D. Termination:

Title 43, 3307.3-4 and 3307.3-6 provide for the removal of all structures when no longer required for operations. The removal must be completed within a period of one year following the expiration of the lease, and the structures must be removed to a sufficient depth beneath the surface of the waters to prevent them from being a hazard to navigation and the fishing industry.

OCS Order No. 3 requires that all casing and piling shall be severed and removed to at least 15 feet below the Gulf floor and the location shall be dragged to clear the well site of any obstructions.

This proposed action must be viewed as one part of a continuing activity that has been underway since the 1940's. Although primary emphasis has been placed on this particular sale, it should be put into the perspective of an on-going offshore oil and gas development process. As of June 23, 1977, there have been 34 OCS oil and gas (and five OCS sulfur and salt) lease sales on submerged lands in Federal areas of the Gulf of Mexico.

Currently, the Bureau of Land Management holds 495 permits on the OCS resulting in 5,862 miles of offshore pipelines. These figures are as of October 31, 1977, and exclude 12 pending applications.

As production declines in existing areas, much of the equipment, transportation facilities, and personnel can be used for new areas of activity. As existing areas of production decline, the pipelines in place can be used for new production areas, adjacent or further from shore, reducing the number of pipelines necessary to transport production from new areas to shore. This latter event has already been exercised in some areas of offshore Louisiana. Likewise, a reduction in quantity of onshore facilities, such as treatment plants, refineries, storage facilities, etc., is made possible by utilizing existing facilities, equipment, and technology.

Proposed OCS planning schedules are developed in order to project the timing, size, and location of specific sales for an OCS leasing program. The goal of the proposed schedule is to provide for orderly development of OCS oil and gas in order to maintain an adequate contribution of OCS production to the national supply and to provide early information concerning areas proposed for leasing activities.

Western and Central Gulf of Mexico:

These proposed lease sales would provide for the orderly and timely development of oil and gas reserves expected to occur on 115 tracts on the Outer Continental Shelf (OCS) in Federal waters in the Gulf of Mexico offshore of Texas, Louisiana, Mississippi and Alabama.

These tracts include approximately 545,255.24 acres and range from 3 to 165 nautical miles (6-189 kilometers) from shore in water depths of 6 to 500 meters. Approximately fifty-eight percent of these tracts are gas prone, four percent are oil prone, and thirty-eight percent are both oil and gas prone.

Surveys indicating seismic refraction, seismic reflection, gravity, magnetics, bright spot technology, and stratigraphic correlation are collected before and after leasing to assist in the determination, location, and magnitude of petroleum resources. Surface vessels of the 50 to 300 ton class are utilized to perform geophysical surveys. In general, seismic surveys record the behavior of shock waves through various rock formations. This information is used to determine the presence of salt domes, folds, faults and sediment thickness.

A. Exploration:

After a lease has been issued, shallow surveys defining geologic hazards, bottom stability, cultural resources and other conditions which might affect exploratory drill site locations are performed. Once a location has been selected, exploratory drilling begins. These drilling operations are basically the same regardless of the type of mobile rig utilized (jack-up rigs, drillships or semi-submersibles). Initially, a drive pipe is installed along with a blowout preventer. The actual drilling process involves the use of introduced muds which acts as lubricants, coolants, and pressure controls. Cuttings or a mixture of mud and drilled materials are a product of the drilling process. Sixty to 160 exploratory wells may be drilled as a result of this action.

B. Development and Production:

When petroleum discoveries are made and the extent of a field has been determined, a plan of development is devised. As a result, 10 to 25 multi-well platforms may be established with the drilling of 60 to 150 production wells.

The production phase of OCS oil and gas operations consists of bringing the product to the surface and preparing it for transport. This phase of the operation may go on for as long as 20 years. Formation waters of reservoir brines are produced in the oil and gas production process.

C. Transportation:

The principal means of getting gas and oil resources in the Gulf of Mexico from production areas offshore to processing and storage locations onshore has been and will continue to be via pipelines. Additionally, the labor force, equipment and supplies needed to service the various stages of offshore operations are transported by crewboats, barges and helicopters. As a result of this proposed action, 100 to 200 miles of new pipeline may be laid. These lines would run from new production facilities offshore and connect with the existing pipeline system to onshore facilities. It is anticipated that no new pipelines to facilities onshore will be required.

D. Termination:

When a reservoir has been depleted to a level at which it cannot produce profitably, operations are terminated. According to industry estimates, with proper placement of wells and sufficient pipeline capacity, a gas reservoir could be drained in as little as 10 years. In contrast, some oil reservoirs have been producing for over 20 years.

OCS orders issued by the U.S. Geological Survey require wells to be plugged, the casing severed adequately below the mudline, the platform removed, and all obstructions cleared from the area. Major trunklines may be used for future production from adjacent areas, but smaller lines would probably be abandoned in place. Abandonment of pipelines consists of flushing the lines of entrained hydrocarbons by water, disposing of the water onshore, and severing the ends below the mudline.

Endangered Species Impacts

Whales:

The posible impacts on whales and their critical habitat from exploratory and development/production activities were given thorough consideration. These included the following:

1. Seismic - It is the opinion of the Consultation Team that no unfavorable impacts would result from seismic operations.

2. Oil Spills - Conceivably, a large oil spill occurring in the immediate vicinity of whales could be harmful because of the possible intake of oil through the blow hole, fouling of the baleen plates, and indirectly from the ingestion of oil contaminated food. However, endangered cetaceans are uncommon in the lease/sale area and are sighted only on rare occasions. Therefore, even if an oil spill occurred in the tract areas, it is unlikely that any endangerd whales will be affected. In addition, there is no historical record of such an occurrence.

3. Boat traffic - Due to the migratory nature of whales, the small increase in boat traffic would have a minimal (non-measurable) impact.

Turtles:

The following exploratory and production/development activities were reviewed to determine possible impacts on sea turtles and their critical habitat:

1. Seismic - None.

2. Oil spills - The effect of oil spills is not known. However, oil ingestion or physical contact by turtles, especially with the eyes and nostrils and particularly in hatchlings entrapped in a spill, could be lethal. Hatchling and juvenile turtles are believed to be passively distributed by surface currents, the same mechanism that spreads oil. None of the five species of sea turtles that are found in the Gulf of Mexico occur in concentrated numbers of assemblages in those waters, and oil spills in limited areas would not be expected to impact on more than a few individuals at sea. Oil spills, however, could have severe impacts on nesting beaches if washed ashore at nesting seasons. Therefore, every effort to minimize the potential for spills should be exercised.

3. Boat traffic - As with whales, the small increase in boat traffic would have a minimal impact on sea turtles.

4. Drilling - Platforms and pipelines may increase habitat by creating "live-bottom" topography. Turtles have been observed to feed on sessile organisms attached to platforms. During the period from mid-

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summer to mid-fall, lights on drilling platforms near shore could attract hatchling turtles resulting in abnormal concentrations. These disoriented turtles would possibly be subjected to increased predation. It is recommended that monitoring of the effect of lights, particularly on hatchling loggerheads, be conducted to determine the significance of their impact.

Biological Determination and Need for Additional Information or Further Consultation:

After a careful review of the findings by the Consultation Team, it is my biological opinion that the proposed project is not likely to jeopardize the continued existence of the endangered or threatened species listed above or result in the destruction or adverse modification of habitats determined to be critical to them. This biological opinion is based on the general information in the EIS concerning possible effects of the proposed actions and does not relieve BLM or USGS of the continuing responsibility of reviewing their activities and programs in light of their Section 7 consultation should new information reveal impacts of the identified activities that may affect listed species or their habitats, or these activities are subsequently modified, or a new species is listed that may be affected.

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES 375.4

4/16/79

MEMORANDUM

To: Director, Bureau of Land Management & U.S. Geological Survey

From: Director

Subject: Biological Opinion Regarding Oil and Gas Leasing and Exploration Activities in the Gulf of Mexico

By memorandum received December 6, 1978, the Bureau of Land Management (BLM) requested formal consultation on a regional basis for the Gulf of Mexico oil and gas leasing activities (copy attached). At that time 16 species were included in the request. Through conversations with the BLM New Orleans OCS Office, ten species which could be affected were added to this list of species in order to include all the coastal Endangered and Threatened species found from Key West, Florida, to Brownsville, Texas.

In response to this request, I appointed a consultation team by memorandum of December 28, 1978, (copy attached) to assist me in determining whether leasing and exploration activities are likely to jeopardize the continued existence of the Endangered or Threatened species or result in the destruction or adverse modification of their Critical Habitat.

The team was comprised of Robert Jacobsen, Chief, Branch of Management Operations, Office of Endangered Species (OES); Nancy Sweeney, Team Leader, OES; Jack Edmundson, Team Leader, OES; Robert Cooke, Endangered Species Specialist (Region 4, Atlanta, Georgia); Jim Baker, Endangered Species Biologist (Region 4, Jacksonville, Florida); and Jim Barkuloo, Coastal Ecosystems Specialist (Region 4, Panama City, Florida).

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On January 30, 1979, the U.S. Geological Survey (GS) requested the inclusion of exploration activities in the regional Gulf consultation initiated by BLM on leasing activities (copy attached). Since exploration plans must be approved or disapproved within 30 days, the Fish and Wildlife Service (FWS) has insufficient time to consult on each exploration plan. The GS and FWS held a meeting on January 19, 1979, to discuss this issue. It was later decided, with the concurrence of BLM, that a combined consultation would be held for the Gulf of Mexico. Therefore, this consultation includes both BLM leasing and GS exploration activities for the Gulf.

On February 6 and 7, 1979, the consultation team met with BLM and GS representatives to discuss the leasing and exploration activities in the Gulf of Mexico. A list of participants is attached.

The consultation team reviewed reports, publications, and correspondence from knowledgeable sources on the species in question, and in addition, numerous telephone contacts were made with other experts. Information contained in Final Environmental Impact Statements (FEIS) for OCS Sales 51 and 65, western and central Gulf and eastern Gulf of Mexico, respectively, was carefully evaluated to ascertain the effects of the leasing and exploration activities. Copies of pertinent records and documents are included in an administrative record maintained at the Office of Endangered Species and are incorporated by reference.

Project Description

The BLM acts as agent for the Secretary, Department of Interior, in processing bids on the advertised lease sales. After issuance of the leases, primary regulatory authority for exploration, development, and production of the lease tracts shifts to GS and other Federal agencies.

Exploration of the OCS requires certain onshore support facilities including office space, helicopter and fixed-wing aircraft facilities, docks for boating activities, and supply bases. Due to the uncertain nature of oil exploration, companies are generally unwilling to construct new facilities to support this operation. They prefer instead to utilize existing areas and facilities.

At the present, there are numerous onshore facilities throughout the Gulf of Mexico being used for exploration activities. Should the use of these facilities be changed or additional onshore facilities be needed which may affect listed species or their habitats, consultation must be reinitiated. This biological opinion is based on two assumptions; that existing onshore facilities will be utilized and that the probability of an oil spill occurring, or reaching the species or habitat during exploration activities, is minimal.

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Should exploration activities reveal the presence of significant amounts of hydrocarbons, development and production activities will take place. During these activites, new onshore facilities will be constructed when needed; barges and tankers will transport oil until necessary pipelines are installed, and oil spillage will occur. The development and production activities may affect Threatened and Endangered species, therefore, Section 7 consultation will be required. This biological opinion considers the leasing and exploration activities which may occur within the Gulf of Mexico provided that new facilities or patterns of use are not initiated. Development and production phases (referred to as development/production throughout this opinion) are not included in this opinion.

A summary of the biological data and considerations of the consultation team are provided for all 26 species.

Red Wolf (Canis rufus)

The red wolf was originally listed as Endangered in the Federal Register on October 13, 1970. Today, the only genetically pure population not in captivity may be found along the Gulf coast in Chambers and Jefferson Counties, Texas, and in Cameron and Vermilion Parishes, Louisiana.

Habitat for the red wolf is generally limited to coastal areas consisting of marshlands and coastal prairies, pine hardwood forests with heavy brush understory, and old fields overgrown with tall grasses and bushes. To date, Critical Habitat has not been determined for this species. The red wolf feeds primarily on rabbits, nutria, rodents, marsh birds, waterfowl, crabs, and carrion.

Several factors are known to be contributing to the decline of the red wolf, including: interbreeding with coyotes, urbanization, industrialization, hunting, trapping, and parasitism.

It is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of this species. However, any activity or program authorized, funded, or carried out by a Federal agency which may affect the Endangered red wolf or its habitat, particularly any new onshore facilities related to exploration and development/production activities of the lease areas, will require Section 7 consultation.

Attwater's Prairie Chicken (Tympanuchus cupido attwateri)

Attwater's prairie chicken was listed as an Endangered species in the Federal Register on March 11, 1967. Approximately 1,500 individuals of this species remain in local colonies on the mid-Texas coast. Coastal prairie is considered

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an essential habitat component. Cord grass (Spartina spartinae) prairie is also capable of supporting prairie chickens where it is interlaced with knolls and ridges of better-drained ground. Prairie chickens can also live in favorable combinations of native prairie, pasture, and cultivated lands. Seed and seed pods of such plants as ruellia, stargrass, bedstraw, doveweed, and perennial ragweed are important food items.

Reduction of coastal prairie habitat has been an important factor leading to the decline of this species. In 1967 it was estimated that the species occupied 234,000 acres whereas today, it is estimated that 170,000 acres support the species. Based upon pending or planned conversion of coastal prairie, a further 16 percent reduction of supportable habitat will occur by the mid-1980's. Grazing, urban development, and hurricanes have also been associated with this decline. The reduction of viable prairie chicken habitat is resulting in the isolation of prairie chickens into small populations that are more susceptible to local extirpation.

Impacts from offshore leasing and exploration would be associated with the onshore development which could cause habitat destruction or disturbance of breeding and nesting activities. Since existing onshore facilities will be utilized during the exploration phase, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the species nor adversely modify habitat essential for its survival. However, any activity or program authorized, funded, or carried out by a Federal agency which may affect this species, particularly onshore facility proposals and proposed development/production activities, will require Section 7 consultation.

Arctic Peregrine Falcon (Falco peregrinus tundrius)

The Arctic peregrine falcon was listed as an Endangered species in the Federal Register on October 13, 1970. The bird is a medium sized falcon which is listed as Endangered in Canada, the United States, and Mexico. Critical Habitat has not yet been determined for this subspecies.

This subspecies breeds in the North American tundra and winters along the Gulf coast from Florida, west to the eastern Mexican coast and Baja California, south to mid-Chile and mid-Argentina, and possibly on Pacific Islands.

Field and laboratory evidence indicates that the decline of peregrine populations is generally due to the presence of chlorinated hydrocarbon pesticides in the falcon's food supply. This leads to reproductive failure through eggshell thinning and non-viable eggs, as well as, increased adult mortality. Other factors which may cause local decreases in reproductive success are human disturbance and adverse weather conditions during nesting.

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Essential habitat for the Arctic peregrine includes preferred breeding areas near rivers, lakes, or the sea in the Arctic tundra, where nesting sites include cliffs, dykes, cutbanks, and occasionally boulders, hummocks, or the ground. While the Arctic peregrine migrates south through a broad area of eastern and middle North America to the Gulf coast, it funnels into coastal areas and concentrates along the beaches and barrier islands.

The Arctic peregrine feeds mostly on a wide variety of birds and occasionally on small mammals. Peregrines will kill oiled birds and in doing so, ingest considerable numbers of feathers with their meal. The impact of this ingested oil is unknown.

The possible impacts on Arctic peregrines from OCS leasing and exploration include the contamination of the peregrines' food sources and disruption of habitat along their migration route. Existing onshore facilities will be utilized for exploration, and the possibility of an oil spill during exploration activities is minimal. Therefore, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the Arctic peregrine. However, any onshore activities requiring new facilities or any activity or program, authorized, funded, or carried out by a Federal agency which may affect the Arctic peregrine or its habitat, including proposed development/production activities, will require Section 7 consultation.

Red-Cockaded Woodpecker (*Picoides* (=*Dendrocopos*) *borealis*)

The red-cockaded woodpecker was listed as an Endangered species in the *Federal Register* on October 13, 1970. Recent literature indicates the species is presently decreasing in numbers and its populations are being fragmented by habitat loss.

The historic range of this non-migratory species includes the southeastern United States as far west as east Texas and southeastern Oklahoma, as far north as southern Missouri, southcentral Kentucky, and southeastern Maryland, and as far south as Long Pine Key in the Florida Keys. Their present distribution is thought to be similar to the above delineated range except that the extreme limits have contracted to some extent. More importantly, within the species range, its populations are becoming increasingly fragmented.

In all parts of its range, the red-cockaded woodpecker is found primarily in mature, open pine forests. The cavity trees are always living pine trees and usually over 60 years old with red-heart disease. The diet of the red-cockaded woodpecker is primarily arthropods and seasonally available fruits. Stomach analysis indicates that food consumption is about 81 percent insects and 19 percent vegetable matter.

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The decline of this species has generally been attributed to habitat loss resulting from widespread changes in forest management practices over the past 25 years. Increased demands from the pulping industry, along with a general trends toward shorter timber rotations, has in many areas precluded the pine stands over 60 years old necessary for this species.

With the use of existing onshore facilities for exploration activities, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the species. However, any activity or program authorized, funded, or carried out by a Federal agency which may affect the red-cockaded woodpecker, particularly any proposed onshore facilities related to oil and gas exploration or development/production activities, will require Section 7 consultation.

Whooping Crane (Grus americana)

The whooping crane was originally listed as Endangered on March 11, 1967. Its wild breeding population nests in Wood Buffalo National Park, Northwest Territories, Canada, and winters from October to April on and adjacent to the Aransas National Wildlife Refuge in the Texas Gulf coastal areas.

Their migratory range includes the Canadian Provinces of the Northwest Territories, Alberta, Saskatchewan, Manitoba, and the States of Montana, North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Critical Habitat has been determined for a portion of their migratory route and winter range and was published in the Federal Register on May 15, 1978.

The total population numbers a little over 100, though the wild Texas population as of January 1979 numbered 74. This represents an increase over the 15 known birds reported in 1939 and may be indicative of a continuing expansion of the whooping crane population.

Parents and young-of-the-year remain together as family units for nearly a year, separating on their return trip back to their muskeg nesting areas in Canada. Tidal salt flats, including ponds and estuaries, are typical winter habitat. On their wintering area in Texas, their preferred foods include blue and fiddler crabs, clams and mudshrimp from tidal areas, frogs, crayfish, and snails from freshwater ponds.

Factors which contributed to the decline of the whooping crane include the loss of habitat, overutilization of the species, and a low reproductive potential.

Since the whooping crane's major winter food items are aquatic organisms, an oil spill could prove harmful to the species. The whoopers feed in water by probing into mud. Further, its wading habits (on occasion they may be

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submerged up to their shoulders) could result in oil coating its feathers in the event of an oil spill. And lastly, ingestion of oil coated prey may be adverse to the individual bird's well-being and reproductive capability and could prove harmful to the species.

Since the probability of an oil spill occurring during exploration activities is minimal and existing facilities will be utilized, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the whooping crane or destroy or adversely modify its Critical Habitat. GS should continue to place aircraft height restrictions on the helicopter and fixed-wing aircraft traffic around the whooping crane's winter Critical Habitat on and adjacent to the Aransas National Wildlife Refuge from October to April. Furthermore, should any onshore activities requiring any Federal action be proposed for the area between Port Aransas and Port O'Connor that would affect the whooper environment, Section 7 consultation will be required. Additionally, any activity or program authorized, funded, or carried out by a Federal agency which may affect the whooping crane, especially nearshore or onshore pipelines associated with development/production activities, Section 7 consultation will be required.

Mississippi Sandhill Crane (Grus canadensis pulla)

Records indicate that the Mississippi sandhill crane was probably never very common. It is presently restricted to a relatively small area in Jackson County, Mississippi. The species was classified as Endangered on June 4, 1973, and its Critical Habitat was promulgated in the August 8, 1977, Federal Register. Present population estimates range from 30 to 50 individuals.

The species is non-migratory and has established fairly restricted nesting, feeding, and winter roosting areas. Nesting is normally limited to the semi-open, wet, savanna areas within its range. All known current nesting occurs within the Critical Habitat area with the exception of one nest approximately 8 miles north of this area. Feeding is generally limited to the wet savanna or marsh and agricultural fields and pastures. Their diet is varied and includes insects, aquatic animals, and plant material, including roots and tubers and grain from agricultural fields. Winter roosting areas have been identified within the Pascagoula River swamp area east of the nesting area.

The current status of the species is attributed to habitat loss which has occurred from land drainage and other land use practices. Drainage projects have increased the potential for both commercial development and the conversion of many acres into pine plantations. Other land changes are associated with the present grazing laws. Previous open range laws have prompted the use of fire to maintain grazing conditions. Recent closed grazing laws, however, in addition to increased pine plantations, have generally precluded the use of fire in most areas.

It is my biological opinion that impacts relative to the leasing and exploration activities are not likely to jeopardize the continued existence of the Endangered Mississippi sandhill crane or result in adverse modification or destruction of its Critical Habitat. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly those related to development/production activities of the lease areas, which may affect the Endangered Mississippi sandhill crane or its Critical Habitat, will require Section 7 consultation.

Brown Pelican (Pelecanus occidentalis)

The brown pelican was ~~orig~~inally listed as Endangered on October 13, 1970. The bird normally ranges on the eastern seaboard from North Carolina to Florida and around the Gulf coast to Texas and Mexico, southward to Venezuela, as well as the West Indies and Islands of the Caribbean. Within the United States a small population of about 50 individuals exists in Texas and is increasing slowly. Louisiana populations are those restocked from Florida since 1968, plus offspring from those birds. This new Louisiana population suffered a decline of approximately 40 percent in 1975 and now numbers about 200 birds. Both Carolina populations are relatively small and nearly stable. In Florida a stable population of 20,000 - 30,000 is reported. Critical Habitat has not yet been determined for this species.

The habitat of these colonial nesters is small coastal islands in salt and brackish waters. Nests are constructed from available vegetation. The major food of the pelican is fish, including menhaden, mullet, sardines, and pinfish. The pelican catches these fish by plunge-diving in coastal waters. Brown pelicans are rarely found away from saltwater and typically do not venture more than 20 miles (32 km) out to sea. Extensive use of pesticides which were ultimately ingested by the brown pelican has been noted as the primary cause of the current population decline of the species.

Pelicans may be susceptible to oil spills. As brown pelicans dive for fish, their entire body can be coated with oil. This may contribute to direct mortality or could result in a secondary impact in reduced hatchability of eggs that may become oiled by a contaminated adult bird.

The brown pelican is extremely susceptible to disturbance and habitat alteration of key nesting areas. It is imperative to prevent disturbance of nesting colonies that could cause nest desertion and egg losses.

Since existing onshore facilities will be utilized, and the possibility of an oil spill occurring from exploration activities is minimal, it is my biological opinion that the leasing and exploration activities are not

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likely to jeopardize the continued existence of the species. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly those related to proposed onshore facilities and development/production related activities, will require Section 7 consultation.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was initially considered to have two distinct subspecies when the southern bald eagle was listed as an Endangered species in the *Federal Register* of March 11, 1967. The entire species was listed as Endangered in 43 of the conterminous 48 States and Threatened in the remaining five States on February 14, 1978. The bald eagle populations occurring within the area which may be impacted by this proposal are listed as Endangered.

In the Southeast, bald eagles actively nest in South Carolina, Florida, Mississippi, Louisiana, and Texas. Suitable habitat appears to be available in North Carolina, Georgia, and Alabama but there is no known nesting activity in these States. Nesting occurs from November to April in the Gulf coast area.

Florida had at least 319 active nesting territories distributed throughout most of the State during the 1977-78 nesting season. The west coast counties of Florida have a large number of active bald eagle nesting territories. With the exception of Dixie and Jefferson Counties, each county from Franklin east and south along the Gulf has nesting bald eagles. Concentrations of nesting territories are from the Waccasassa River to Tampa Bay and from Englewood through Florida Bay.

The only known active nest in Mississippi is in Harrison County. The nest is inland and within visual distance of Interstate 10. There were nine reported active territories in Louisiana during the 1977-78 nesting season, located primarily in the coastal parishes. Approximately 8 to 11 breeding pairs of eagles are located in Goliad, Refugio, Calhoun, Victoria, Matagorda, Brazoria, Orange, and Trinity Counties in Texas.

Eagles are opportunistic feeders, with fish constituting the bulk of their diet. They will also feed on waterfowl and shorebirds, particularly sick or injured individuals, as well as carrion. Throughout most of the bald eagle's range, its population decline has been largely attributed to the effect of pesticide ingestion (which resulted in eggshell thinning) and indiscriminate shooting of both immature and adult birds. Florida appears to be an exception, where the primary factors at this time are loss of habitat through urbanization.

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The two potential sources of impact to the eagle from leasing and exploration activities are disturbance to its nests, resulting from development of onshore facilities, and the possibility of an oil spill reaching the coast and contaminating the food source of the eagle.

Since the onshore facilities for leasing and exploration activities will be those already in existence and the possibility of an oil spill occurring during exploration activities is minimal, it is my biological opinion that these activities are not likely to jeopardize the continued existence of the bald eagle. However, any activity or program authorized, funded, or carried out by a Federal agency, especially development/production activities, which may affect bald eagles or active nesting sites, will require Section 7 consultation.

Sea Turtles

Populations of the listed sea turtles have declined due to commercial overutilization of eggs and turtles, increased natural predation on eggs and hatchlings, incidental catches by commercial fishermen, and possibly littering of the seas (plastic bags give the appearance of jellyfish and can kill if consumed).

Sea turtle nesting habitat may be impacted by oil spills and human disturbance resulting from OCS activities. Disturbance by development and other human use of beaches is incompatible with successful sea turtle nesting. Sea turtles hatch at night and move toward the brighest light, which normally would be the moon reflecting on the ocean. Bright lights in the nesting beach areas could disorient this migration, rendering the young turtles vulnerable to road traffic or predators.

The National Marine Fisheries Service (NMFS) has jurisdiction over Endangered sea turtles while they are in the aquatic environment. When the turtles are onshore they are under the jurisdiction of FWS. Therefore, the following information on five sea turtles relates to impacts of leasing and exploration activities on onshore turtle habitat.

The effect of development/production activities on sea turtles is not included as those phases are not being consulted on at this time. It should be noted, however, that we are currently unaware of the existence of much information concerning the effect of oil spills on nesting sea turtles and their habitats.

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Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

The Kemp's ridley sea turtle was originally listed as Endangered on December 2, 1970. The adult turtle is found only in the Gulf of Mexico. Immature ridleys also occur along the Atlantic coast as far north as Massachusetts and are sighted infrequently along European shores. The essential habitat of the Kemp's ridley includes shallow coastal and estuarine waters often associated with subtropical shorelines of red mangrove. In the United States, this species is believed to sporadically nest in Kleberg, Kenedy, Willacy, and Cameron Counties, Texas. The entire population now nests primarily on approximately 14 miles (24 km) of beach in the State of Tamaulipas, Mexico. Nesting female population estimates for 1947 were 40,000; 2,000 to 4,000 in 1973; 400 to 500 in 1976; and approximately 300 in 1978. Currently, there exists an international project to reestablish a viable breeding population on Padre Island National Seashore. In 1978, turtle eggs were collected in Mexico and hatched and imprinted in the United States.

Portunid crabs (*Callinectes* spp.) make up a large portion of the turtle's diet. These turtles also feed on other crabs, shrimp, snails, echinoderms, medusae, and fish. The northern Gulf off the coast of Louisiana has been identified as a major feeding area.

Although the Kemp's ridley sporadically nests on Padre Island and is believed to nest on the beaches of Kleberg, Kenedy, Willacy, and Cameron Counties on the Texas Gulf coast, it is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of the Kemp's ridley sea turtle. This is due to the minimal likelihood of an oil spill occurring during exploration activities, and that existing onshore facilities will be utilized. Should additional onshore facilities or a change in the use of the existing facilities be proposed, Section 7 consultation will be required. Additionally, any activity or program authorized, funded, or carried out by a Federal agency, particularly development/production activities, which may affect the nesting sites of the Kemp's ridley, will require Section 7 consultation.

Hawksbill Sea Turtle (*Eretmochelys imbricata*)

The hawksbill turtle was originally listed as Endangered on June 2, 1970. The distribution of the hawksbill in the Atlantic Ocean extends from southern Brazil to Massachusetts. Nesting occurs on scattered islands and shores generally between 25 degrees north and south latitude. In the conterminous United States there have been only two reported nestings in Florida.

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Hawksbills frequent rocky areas, reefs, shallow coastal areas, lagoons of oceanic islands, and narrow creeks and passes, and are generally found in water less than 20 meters deep. Hatchlings are often found floating in masses of sea plants. Nesting is at random, probably without established nesting sites, usually on undisturbed deep-sand beaches in the tropics.

The hawksbill feeds on the bottom and forages close to shores and reefs. It is omnivorous although it prefers invertebrates.

Population estimates are not available. Although the former distribution was probably equal to the present, population numbers have declined considerably. Many nesting beaches have been abandoned due to natural disasters (such as hurricanes and erosion), alteration of habitat, or commercial utilization by man.

It is my biological opinion that since the hawksbill turtle is not known to nest on the beaches in the Gulf of Mexico, the leasing and exploration of OCS lands are not likely to jeopardize the continued existence of the hawksbill turtle or destroy or adversely modify nesting habitat essential to its survival and recovery.

Leatherback Sea Turtle (Dermochelys coriacea)

The leatherback turtle was originally listed as Endangered on December 2, 1970. Critical Habitat in the Virgin Islands has been determined and was published in the Federal Register on September 26, 1978. The distribution of the leatherback is worldwide, consisting of tropical Atlantic, Pacific, and Indian Oceans. It is also found in small numbers in waters as far north as British Columbia, Newfoundland, the British Isles, and as far south as Australia, Cape of Good Hope, and Argentina. The leatherback has also been sighted in the Mediterranean Sea. It was formerly more widely distributed in the Mediterranean, Atlantic, Pacific, and Indian Oceans. The major nesting beaches are in Malaysia, Surinam, French Guiana, Mexico, Costa Rica, and South Africa.

Although one nest was reported to have occurred in 1966 in North Carolina, nesting in the United States is usually restricted to Florida. Atlantic coast nests have been recorded from Flagler Beach to Miami with the majority of records from Palm Beach and Martin Counties. There appears to be a small population that nests regularly on Hutchinson Island, Martin County. On the Gulf coast, sightings are common in March and April. Nesting has been reported on the Florida Gulf coast.

The most pelagic of the sea turtles, the leatherback may often be found near the edge of the continental shelf. In northern waters they occasionally enter shallow estuarine bays.

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The leatherback is an omnivorous turtle. Its preferred food is jellyfish, but it also consumes sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed.

Since the leasing and exploration activities in the Gulf of Mexico will use existing onshore facilities, and the likelihood of an oil spill resulting from exploration activities is minimal, it is my biological opinion that these activities are not likely to jeopardize the continued existence of the leatherback turtle. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly additional onshore facilities for exploration activities and development/production proposals, will require Section 7 consultation.

Green Sea Turtle (Chelonia mydas)

The green sea turtle was listed as Threatened in the Federal Register on July 28, 1978, in all of its eastern North American range except the State waters of Florida, where it is Endangered. Critical Habitat has not yet been determined.

This turtle has a broad, heart-shaped shell and small head, and is found throughout the world in tropical and semi-tropical waters. In eastern North America it is found from the coasts of Massachusetts to Mexico. The known United States nesting is limited to southern Florida beaches. Nesting on the east coast ranges from Cape Canaveral National Seashore southward with concentrations located on Merritt, Hutchinson, and Jupiter Islands, and Hobe Sound National Wildlife Refuge; and on the west coast from Marco Island to the Florida Keys. Favored habitat appears to be lagoons and shoals with an abundance of marine grass and algae. Adult green turtles are primarily herbivorous, although mollusks and crustaceans are also eaten. Immature green turtles are more omnivorous than adults in their feeding habits.

Since the leasing and exploration activities will utilize existing onshore facilities, and the possibilty of an oil spill occurring during exploration activities is minimal, it is my biological opinion that these activites are not likely to jeopardize the continued existence of the green turtle. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly additional onshore facilities and development/production proposals, will require Section 7 consultation.

Loggerhead Turtle (Caretta caretta)

The loggerhead sea turtle was listed as Threatened in the Federal Register on July 28, 1978. The loggerhead is a large sea turtle weighing up to 300 pounds and occurs on the east coast of North and South America from Newfoundland to Argentina and in the Canary Islands. The loggerhead wanders widely throughout

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the marine waters of its range and has been found as far as 500 miles out in the open sea. Nesting occurs on various barrier islands and beaches from Chincoteague National Wildlife Refuge, Virginia, south to the Florida Keys on the east coast. In the Gulf of Mexico, loggerheads nest on various barrier islands and beaches throughout the Keys and up the Florida west coast to the Chandelier Islands, Louisiana. The loggerhead feeds primarily on shellfish. They will also feed on fish, sponges, jellyfish, and marine grasses.

Since the leasing and exploration activities will utilize existing facilities, and the possibility of an oil spill occurring during exploration activities is minimal, it is my biological opinion that these activities are not likely to jeopardize the continued existence of the loggerhead. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly additional onshore facilities and development/production proposals, will require Section 7 consultation.

American Alligator (*Alligator mississippiensis*)

The American alligator was originally listed as Endangered on March 11, 1957, and subsequently was reclassified as Threatened (similarity of appearance) in Cameron, Vermilion and Calcasieu Parishes in Louisiana in the *Federal Register* on September 26, 1975. It was reclassified as Threatened in the wild in Florida and in certain areas of Georgia, Louisiana (except in Cameron, Vermilion, and Calcasieu Parishes), South Carolina, and Texas in the *Federal Register* on January 10, 1977. The distribution of the alligator in the United States extends from North Carolina to south Florida and the Gulf coast states and inland to Oklahoma and Arkansas. Critical Habitat has not yet been determined for the alligator. The alligator prefers fresh water but can tolerate different levels of salinity, and in coastal areas it can adapt to brackish water. The alligator prefers marsh areas but is found in small ponds, creeks, man-made canals, rivers, streams, and estuarine bays. The alligator preys chiefly on vertebrates such as fish, frogs, turtles, and nutria. Available carrion is also eaten.

The alligator was listed primarily because of commercial overharvesting and habitat loss. The alligator has recovered to a Threatened status in the coastal areas of Texas, South Carolina, Georgia, Louisiana, and Florida.

Two potential impacts from exploration activities are recognized. One is that oil could contaminate the alligator's food source. However, the effects of ingested oil on the alligator is not known at this time. The other impact would occur if onshore development decreased the suitable habitat necessary for the survival and recovery of the alligator.

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Since the leasing and exploration activities will utilize existing facilities, and the possibility of an oil spill occurring during exploration activities is minimal, it is my biological opinion that these activities are not likely to jeopardize the continued existence of the American alligator. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly related to onshore activities of expanded exploration and proposed development/ production activities, will require Section 7 consultation.

Florida Manatee (Trichechus manatus)

The Florida manatee was originally listed as Endangered on March 11, 1967. Historically, the range of the manatee in the United States was from New Jersey to southern Texas, with an estimated population of several thousand individuals. The present range of the species in the United States is from North Carolina to Louisiana. The present estimated population is 750 to 900 animals, mostly concentrated in Florida.

The manatee is apparently migratory. During the winter months when the water temperature to the north drops below 21°C, manatees concentrate on the coast of peninsular Florida from the Crystal River (west coast) around the Florida peninsula to Titusville (east coast), and from Jacksonville south in the St. Johns River. During the summer months the population disperses along the coast.

Critical Habitat for this species has been determined and was published in the Federal Register on September 24, 1976. It includes portions of the Florida Gulf coast in Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties. The manatee is an aquatic herbivore feeding on submergent, emergent, and floating plants apparently in that order of preference.

Initial population decreases resulted from commercial overharvesting for meat, oil, and leather, but the primary reason for the current Endangered status of the Florida manatee is attributed to mortality from accidental collisions with boats and barges. However, malicious killings do occur to an unknown degree. Actual physical habitat loss is of secondary importance, but the impact of increased boat traffic on manatee habitat is considered serious.

Because of the increasing recreational boating activities, increased support boat traffic for dredging, and existing commercial boat traffic, it is my biological opinion that boating activities between Cedar Key and Key West, Florida resulting from OCS leasing and exploration, with possible development (should significant quantities of oil and gas be discovered), are likely to jeopardize the continued existence of the Florida manatee and to adversely modify its Critical Habitat. It is my belief that the use of Tampa/Port Manatee as the support base for exploration activities resulting from OCS lease sales on the west Florida shelf would avoid jeopardizing the manatee or

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adversely modifying the manatee's Critical Habitat even though this port is adjacent to the designated Critical Habitat of the manatee, because impacts are expected to be minimal when boating activities are restricted to the deeper ship channels from Egmont Channel to Port Manatee. Any OCS oil and gas activities resulting from OCS lease sales which anticipate the use of bases of operation between Cedar Key and Key West, with the exception of Tampa/Port Manatee, may affect the manatee and will require Section 7 consultation. Requests for consultation must include the following information:

a. Location of the port to be used for operations;

b. Routes or channels to be used by the vessels and the relationship between these routes and manatee habitat or migration routes;

c. Description of vessels to be used for support of OCS operations (design, speed, draft, and other pertinent information);

d. Determination of whether the vessels used for OCS oil and gas operations have characteristics which would be more detrimental to manatees than those currently used in manatee habitat.

American Crocodile (Crocodylus acutus)

The American crocodile was listed as Endangered in the Federal Register on September 25, 1975. Critical Habitat was designated in the Federal Register on September 24, 1976. The crocodile lives only in southern Florida where estimates of the present population range from 200-400 individuals.

They breed only in southern portions of Everglades National Park, chiefly along Florida Bay, and on adjacent Key Largo. Another population is reported from the Lower Florida Keys on Big Pine, Little Pine, and Howe Pine with breeding rumored on Little Pine Key. Individuals have been reported in Biscayne Bay on the east coast of Florida and Marco Island and Charlotte Harbor on the west coast.

The decline of the crocodile is due to habitat loss from the increased urbanization of south Florida and from the increased human recreational use of the area. Mortality due to commercial fishing nets and automobiles, as well as malicious killings by uninformed people, have all contributed to the decline of the American crocodile.

The crocodile utilizes coastal areas and inhabits more saline areas than alligators. Adults feed primarily on fish and the young on aquatic invertebrates. Nest construction begins in April, egg laying in April

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or May, with the hatch occurring in July and August. Although the ritualistic nesting requirements are not thoroughly understood, it is felt that nest disruption from human disturbance during the incubation and hatching period could be a critical factor.

There have been only a few exploratory wells drilled south of Naples, Florida. Due to the American crocodile's narrow geographical range, low numbers, and coastal habitat, it is an extremely sensitive species. Although the direct effects of oil on the crocodile are not known, an oil spill which reaches the coastal area could contaminate their food source.

Because of the minimal possibility of an oil spill occurring during exploration activities, and the anticipated use of existing onshore facilities, it is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of the American crocodile or destroy or adversely modify the Critical Habitat of the species. However, if a significant amount of oil and gas are found during exploration, development/production will follow. Any development/production activities occurring in or near the Cape Sable/Florida Bay area will require Section 7 consultation. At that time, further information will be necessary to determine the effects on the American crocodile. This information should include site specific transportation methods to be used, location of all onshore facilities associated with OCS activities, an oil spill trajectory study including current direction/velocity information, and other pertinent information.

Schaus' Swallowtail Butterfly (Papilio aristodemus ponceanus)

The Schaus' swallowtail butterfly was listed as Threatened in the Federal Register on April 28, 1976. Prior to its discovery in Biscayne National Monument in 1971, this butterfly was on the verge of extinction due to overcollecting and habitat destruction by developers. It's distribution is limited to the areas of tropical hardwood hammocks around Biscayne National Monument.

The loss of suitable habitat would adversely affect the Schaus' swallowtail butterfly. However, since existing onshore facilities will be utilized, it is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of this species. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly any onshore development proposed for the Florida Bay area, will require Section 7 consultation.

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Bahaman Swallowtail Butterfly (*Papilio andraemon bonhotei*)

The Bahaman swallowtail butterfly was listed as Threatened in the *Federal Register* on April 28, 1976. The butterfly is found around Biscayne National Monument, living in the tropical hardwood hammocks.

Habitat destruction is a threat to the Bahaman swallowtail butterfly. Since the leasing and exploration activities will utilize existing facilities, it is my biological opinion that these activities are not likely to jeopardize the continued existence of this butterfly. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly any onshore development proposed for the Florida Bay area, will require Section 7 consultation.

Key Deer (*Odocoileus virginianus clavium*)

The Key deer was originally listed as Endangered in the *Federal Register* on March 11, 1967. The population ranges from 400 to 600 individuals. Loss of suitable habitat is the major reason for the Key deer's population decrease. The deer's range is restricted to the islands of the Lower Florida Keys, but only those islands with a permanent fresh water supply are used consistently. Big Pine Key and No Name Key support the largest deer populations.

Key deer will eat any available vegetation, but prefers red mangrove.

With the increase of urban development of the Florida Keys, the habitat of the Key deer is decreasing. Since the leasing and exploration activities will utilize existing onshore facilities, it is my biological opinion that these activities are not likely to jeopardize the continued existence of the Key deer. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly onshore activities associated with development/production, will require Section 7 consultation.

There are seven additional species included in this consultation request which we will address together. They are the American peregrine falcon (*Falco peregrinus anatum*), the Eskimo curlew (*Numenius borealis*), the Everglade kite (*Rostrhamus sociabilis plumbeus*), the Cape Sable sparrow (*Ammospiza maritima mirabilis*), the Bachman's warbler (*Vermivora backmanii*), the Kirtland's warbler (*Dendroica kirtlandii*), and the Ivory - billed woodpecker (*Campephilus principalis*). These seven species, based upon their habitat needs, are not known to occur in areas where leasing and exploration activities could impact them. Therefore, it is my biological opinion that

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the leasing and exploration activities are not likely to jeopardize the continued existence of these species or destroy or adversely modify their Critical Habitat.

Florida Bay

Although this consultation is species oriented rather than being directly conducted for ecosystems, we feel it is appropriate to mention Florida Bay due to its unique character, fragility, and value to Endangered and Threatened species. Within the confines of this vast shallow bay with its associated myriad mangrove swamps and scattered keys, resident or migratory listed species include: the Arctic peregrine falcon, the brown pelican, the bald eagle, the Kemp's ridley turtle, the leatherback turtle, the green turtle, the loggerhead turtle, the Florida manatee, the American crocodile, the Key deer, the Bahaman swallowtail butterfly, the Schaus' swallowtail butterfly, and several proposed plants.

About 20 years ago, several onshore and offshore wells were drilled and subsequently abandoned in the Florida Bay area. At that time, however, the human development of this area was not as extensive nor was the stress placed on the Endangered and Threatened species as great. We have identified this area as a sensitive area and thus exploration or development/production activities proposed in this area may affect Endangered species and will require Section 7 consultation. Additional information will be needed at the time of consultation. This will include an oil spill trajectory study, the type and amount of activities, and the secondary activities which could result.

This information is required to facilitate the FWS in our determination as to whether activities or programs are likely to jeopardize the continued existence of a species or destroy or adversely modify its Critical Habitat.

Cumulative Effects

There are numerous offshore and coastal projects and activities throughout the Gulf of Mexico. Those which could have an impact on the Endangered and Threatened species considered in this regional Gulf oil and gas leasing and exploration consultation will be presented by state.

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Texas

The U.S. Army Corps of Engineers (Corps) has numerous maintenance dredging projects underway or proposed. These maintenance projects include dredging in the Intracoastal Waterway and the ports along the eastern Texas coast.

There are two Corps projects which are not maintenance dredging. They are the widening of the Texas City Channel and turning basin, and the widening of the Brownsville Ship Channel and turning basin. In addition, there are two private dredging projects proposed for this area. The first is a plan to enlarge Sabine Pass to accomodate large ships unloading butane and propane. The second is to enlarge Galveston Harbor and Channel, again to accomodate large petroleum product carriers.

There is a deepwater port proposal for Corpus Christi, Texas. The FWS has recommended that one of the alternatives be adopted instead of the original proposal. The recommendation is to place the deepwater port offshore using a single point mooring system.

There is a liquified natural gas (LNG) plant proposal for Matagorda Bay. This proposal is still in the study stage. Another proposal involves the establishment of strategic petroleum reserves in Texas. The proposed locations are Big Hill salt dome in Jefferson County; Nash salt dome in Fort Bend County; and Bryan Mound salt dome, Allen salt dome, Damon Mound salt dome, and West Columbia salt dome in Brazoria County. These strategic petroleum reserves will store petroleum for an infinite amount of time. When the storage areas are first established, the brine pumped from the salt domes will be discharged into the Gulf. After the salt dome petroleum reservoirs are full, brine reservoirs will be created for disposal of brine when oil is extracted from the storage areas. If there is excess brine at this time, it will be discharged into the Gulf.

There was a former proposal, Seadock, Inc., to construct a deepwater port off the coast of Freeport. The Coast Guard placed operational restrictions on the proposal and it was dropped. Recently, the State (Texas) has picked up the proposal and is conducting feasibility studies on the project now renamed the Deep Water Port Authority. The project will utilize a single point moorin system 26 miles from Freeport where large petroleum transporters will unload their cargoes which will then be piped to shore through a 52-inch diameter pipeline.

Geothermal/geopressure development is a new type of resource development being studied in the Gulf. The Bureau of Economic Geology at the University of Texas is presently under contract from the Department of Energy to develop the technology and hardware to utilize the heat and pressure produced. The University is presently drilling a well near Freeport to measure the amount

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of heat and pressure that is produced over a period of time, and then will calculate how much can be recovered. The brine for geothermal/geopressure drilling will be reinjected into a lower pressure reservoir.

Louisiana

The Corps has numerous maintenance dredging projects along the coast in the ports and in the Intracoastal Waterway. There are two Corps projects which are not maintenance dredging projects. The first is the enlargement of Atchafalaya River and the Chene, Beouf, and Black Bayou to accomodate large offshore drilling equipment. The second project is to alleviate the navigation hazards along the Bayou Lafourche and the Bayou Lafourche-Jump Waterway. They will be dredging the auxiliary channel.

The Louisiana Offshore Oil Port (LOOP) project began construction in October 1977, and will be completed in December 1989. There are three phases to the construction of the LOOP and upon completion there will be six single point mooring systems where foreign petroleum tankers can unload their cargo. From the mooring systems, the cargoes will go through a pipeline (56-inch diameter) to the offshore terminal. This offshore system will be located 18 miles offshore from Galliano. From the terminal, the cargoes will go through a pipeline (48-inch diameter) to the salt dome storage (56,000,000 barrel capacity) at Galliano. From the salt dome storage, petroleum will be pumped via a 42-inch diameter pipeline to St. James Parish for processing or distribution. When the salt dome cavities are first established, the associated brine will be discharged into the Gulf through a 36-inch diameter pipeline near East Timbalier Island. After the cavity formation, a 25,000,000 barrel brine reservoir will be created for use in emptying the cavities when the oil is extracted. When these cavities are being filled and emptied, any brine in excess of the brine reservoir capacity will be discharged into the Gulf. The initial operation will begin in May 1980.

There are potential strategic petroleum reserve sites in Louisiana also. They would function on the same principal as those proposed for Texas. The potential sites are Napoleonville salt dome in Assumption Parish; Bayou Choctaw salt dome in Iberville Parish; Chacahoula salt dome in Lafourche Parish; Cote Blanch Mine in St. Mary's Parish; West Hackberry salt dome and Black Bayou salt dome in Cameron Parish; Vinton salt dome and Sulfur Mines in Calcasieu Parish; and Weeks Island salt dome and Iberia salt dome in Iberia Parish.

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Mississippi/Alabama

The Corps has several maintenance dredging projects scheduled and proposed for Mississippi and Alabama including the Intracoastal Waterway. There is a new project in Mobile Bay, Alabama in which the Corps will widen and deepen the Theodore Ship Channel to provide a turning basin.

Florida

There are a number of Corps maintenance dredging projects in various ports and in the Intracoastal Waterway.

There are also several new dredging projects. The deepening of Tampa Bay is presently underway and will take three to five years to complete. There is a proposal to improve the navigation conditions in the Apalachicola River. This would involve a dam or the deepening of the channel. A feasibility study to make Port St. Joe a deepwater port is presently being conducted. The deepening of Port Manatee and the construction of an electric manufacturing plant at that site is another project. There is a minor port at Boca Grande which is being considered for expansion into a deepwater port and the possible association of an offshore terminal. There is presently a petition to the Corps to alter the drainage patterns of Turkey Creek and Indian River toward the east coast of Florida and the St. Johns River toward the west coast.

The Florida Power Corporation is installing two more generating units at the Crystal River Electric Generating Plant. Commercial service will start in 1982 for one unit and 1983 for the other. An access road and railroad spur are needed.

There is an uranium oxide extraction plant which may start construction as early as April 1, 1979, in Tampa.

The crude oil refinery near Port Manatee will start producing early in 1979. It will produce about 15 to 20,000 barrels of petroleum products per day.

Previous OCS lease sales have proposed the use of Tampa/Port Manatee, St. Petersburg, and Pensacola as possible sites for onshore exploration and development/production facilities. As stated in this biological opinion, the use of ports other than Tampa/Port Manatee (with the stated restrictions) will require Section 7 consultation.

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Conclusion

Based on my consultation team's review of the above information and other information and data available to the Service, it is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of the Endangered or Threatened species considered herein or result in the destruction or adverse modification of their Critical Habitats with the exception of the Florida manatee. Exploration activities may jeopardize the continued existence of the Florida manatee or adversely modify its Critical Habitat unless Tampa/Port Manatee is utilized as stated in the species account above.

However, should construction of additional onshore facilities be needed or a change in the use of existing facilities be required as leasing and exploration activities expand, especially into the western and eastern Gulf of Mexico, Section 7 consultation will be required. Since it has been determined that development/production activities may affect Threatened or Endangered species, Section 7 consultation will be required between the Geological Survey and the Service.

Should a new species be listed, additional information become available, additional onshore facilities be needed for exploration activities, or the project description, as discussed above, be changed, Section 7 consultation will be required. Any activity or program which is authorized, funded, or carried out by a Federal agency which may affect any Endangered and Threatened species will require Section 7 consultation. I would like to remind the Bureau of Land Management and the Geological Survey of their continuing responsibility, under the Endangered Species Act, to remain cognizant of the status of the Endangered and Threatened species in the Gulf of Mexico, and to recognize potential problems which may develop from Federal activities or those activities requiring Federal authorization or funding. If such a problem arises, Section 7 consultation may be required.

/s/ Lynn A. Greenwalt

cc: Directorate Reading File
DD Chron File
AFA File

FWS/OES:NSweeney:mc 3/30/79
FILE 375.4

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In Reply Refer To:
FWS/OES 375.0

AUG 18 1978

Memorandum

To: Director, Geological Survey
Acting
From: Director

Subject: Section 7 Consultation - Proposed Exploration Plans for OCS in Gulf of Mexico

This responds to your July 26, 1978, request for initiation of Section 7 consultation on the pending exploration plans for the Outer Continental Shelf (OCS) blocks in the Gulf of Mexico identified as Matagorda Blocks 591, 601 and 667, Brazos Block A-132 and North Padre Island Block 884.

Because of the complexity of the subject, I am appointing a Section 7 consultation team to carry out the consultation process with the Geological Survey (USGS). The following representatives are hereby appointed to the consultation team:

David Watts - Office of Endangered Species
Gary Halvorson - Region 2, Albuquerque, New Mexico
Russel Petersen - Region 2 Area Office, Galverston, Texas

We anticipate the process to begin on August 21 when the consultation team will meet with your representatives at the USGS Metairie, Louisiana Office. Please contact Mr. Gary Halvorson, FTS 474-3974, if we can be of further assistance in this matter.

S/Harvey Nelson

cc: Directorate Reading File
DD Chron File

FWS/OES:DWatts:mas 8/15/78

On August 22-23, the consultation team met with your representatives and other biologists of the Fish and Wildlife Service (FWS) to discuss the proposed exploration plans and the anticipated effects on the listed species identified above and their habitat. Representatives of three of the producers were there for an introductory comment period and to answer technical questions prior to the commencement of the consultation between USGS and the FWS concerning the exploration plans. A list of participants is attached.

The consultation team reviewed numerous reports, publications, and correspondence from knowledgeable sources on the species in question and, in addition, numerous telephone contacts were made with other experts. Information contained in the exploration plans was carefully evaluated to ascertain their effects on the listed species and their habitats. Copies of pertinent reports and documents are included in an administrative record maintained at the Office of Endangered Species and are incorporated by reference.

Tracts proposed for exploration herein are classified as "gas prone", i.e. one expected to deliver primarily gas during exploration, production and development.

After issuance of the OCS leases by the Secretary, Department of Interior, primary regulatory authority for the exploration, production and development of the lease tracts shifts to USGS and other Federal agencies identified in the Environmental Impact Statement prepared prior to the OCS lease sale. The projected development schedule (copy attached) identifies the various steps requiring USGS approval and approximate time frames for completing production after the award of a lease.

A brief description of the tracts considered is provided:

1. Block Number BA A-132 is leased by the Atlantic Richfield Company. It is located 43 miles from Matagorda Island and has nine exploratory wells proposed. The base of supply for both helicopter and boat access will be at Freeport, Texas.

2. Block Number MI 591 is leased by Sonat Exploration Company and located 10 miles from the Texas coast. Only one exploratory well is proposed at this time. The base of supply for both helicoptor and boat access will be at Port O'Connor, Texas.

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3. Block Number MI 601 is leased by Sonat Exploration Company and is located 10 miles from Texas coast. Only one exploratory well is proposed for the location at this time. The base of supply for both helicopter and boat access will be at Port O'Connor, Texas.

4. Block Number MI 687 is leased by Continental Oil Company and is located 22 miles from the Texas coast. A maximum of four exploratory wells are proposed for the block. The base of supply for both helicopter and boat access will be at Port O'Connor, Texas.

5. Block PI 884 is leased by Mobil Oil Corporation and is located 12 miles from the Texas coast. Five exploratory wells are proposed for the block at this time. Although the original base of supply was stated to be Rockport, Texas, it has since been changed to Ingleside, Texas for boat access and Corpus Christi, Texas for access by helicopter.

6. Block Number Mustang Island A-149 is leased by American Natural Gas Production Company and is located 50 miles from the Texas coast. Six exploratory wells are proposed for the block at this time. The base of supply for both helicopter and boat access is to be either Rockport or Corpus Christi, Texas.

7. Block Number MI 634 is leased by Cities Service Company and is located 17 miles from shore. Three exploratory wells are proposed for the block at this time. The base supply for both helicopter and boat access is to be Port O'Connor, Texas.

8. Blocks PI 948, 955, 956, 966, and 967 are leased by Atlantic Richfield Company and are located 27 miles from the Texas coast. No exploratory wells are proposed for blocks 955, 966, or 967 at this time. Three wells are proposed for block 948 and four wells are proposed for block 956. The base of supply for both helicopter and boat access to the area is to be either Freeport or Ingleside, Texas.

A summary of the biological data and considerations of the consultation team is provided for the 3 listed species.

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Whooping Crane (Grus americana)

The whooping crane was listed originally as Endangered on March 11, 1967. Its wild breeding population nests in Wood Buffalo National Park, Northwest Territories, Canada, and winters from October to April on and adjacent to the Aransas National Wildlife Refuge in the Texas coastal area. Their migratory range includes the Canadian provinces of the Northwest Territories, Alberta, Saskatchewan, Manitoba, and the States of Montana, North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Whooping crane Critical Habitat was proposed on December 16, 1975, in the Federal Register. Nine areas of whooping crane Critical Habitat were determined on May 15, 1978, in the Federal Register and became effective June 14, 1978. A portion of this habitat includes their wintering environment in Aransas, Calhoun and Refugio Counties, Texas.

The total population numbers a little over 100, though the wild Texas population as of August 1978 numbers about 70. This represents a modest increase over the 21 known birds reported in 1941 and may be indicative of a continuing expansion of the whooping crane population.

Parents and young-of-the-year remain together as families for nearly a year, separating on the return to their muskeg nesting areas in Canada. Salt flats, including ponds and estuaries, are typical winter habitat.

In Texas their preferred foods include blue and fiddler crabs, clams and mudshrimp from saltwater areas, and frogs, crayfish, and snails from freshwater ponds.

Factors which contributed to the decline of the whooping crane include the loss of habitat, overutilization of the species, and a low reproductive potential.

Since the whooping crane's major diet occurs in water, an oil spill could prove harmful to the species. The whooping cranes feed in water by probing into mud and, on occasion, may be submerged up to their shoulders. Further, its wading habits could result in oil coating its feathers in the event of an oil spill. And lastly, ingestion of oil coated prey may be adverse to the individual bird's well-being and could prove harmful to the species.

Exploration activities associated with OCS leases on the following locations: Brazos Block A-132, Matagorda Blocks 591 and 601 and 687 and 634, North Padre Island Blocks 884 and 948, 955, 956, 966, 967,

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and Mustang Island Block A-149, are not likely to jeopardize the whooping crane's continued existence or adversely modify or destroy habitat which has been determined as critical to the survival and recovery of the species. There is no information to indicate that an oil spill of sufficient quantity to be adverse to the species will occur in those areas frequented by the whooping crane. This is based upon the knowledge that the closest tracts to habitat utilized by this species are approximately 13 miles distant and considered to be gas prone. Further, within approximately 90 miles of this habitat, all of the tracts (areas of South Padre Island East Addition, North Padre Island East Addition, Mustang Island, Mustang Island East Addition, Matagorda Island, Brazos, and Brazos South Addition) are gas prone which indicates there exists a small potential for oil spill impacts.

Response capabilities have been developed to deal with spills of oil and other hazardous substances both offshore and in coastal waters. Clean Gulf Associates stores various types of clean up equipment at locations along the gulf coast, including Rockport and Galveston, Texas. That organization also provides trained supervisory personnel to direct clean up efforts. Most spills in the Corpus Christi and Aransas Bay areas are handled by the Corpus Christi Oil Spill Control Association. This association stores its equipment in Corpus Christi and has a significant amount of experience in dealing with spills. Less equipment and fewer experienced personnel are located in the Port O'Connor area at the northern end of the whooping crane Critical Habitat. At least two private concerns and the Coast Guard's Port O'Connor office have clean up equipment and are capable of responding to relatively small spills in that area. The Corpus Christi Oil Spill Control Association occasionally backs up clean up efforts in the Port O'Connor area.

However, if any activity or program authorized, funded, or carried out by a Federal agency may affect the whooping crane or its habitat, Section 7 consultation will be required. These actions could include 1) the operation of Service, crew, and barge vessels at and/or between Port Aransas and Port O'Connor which may increase the incidence of boat collisions resulting in the release of petroleum products and other chemical contaminants into whooping crane habitat. 2) the construction and operation of pipelines and associated facilities, 3) the construction and operation of support bases, 4) the construction and operation of onshore development facilities, and 5) the use of fixed-wing aircraft lower than an elevation of 500 feet and helicopters lower than 1000 feet during the period of October 15 through April 15, annually, over areas utilized by whooping cranes. Based on the information provided by USGS, operations conducted out of Port O'Connor to service Matagorda Blocks 591, 601, 687 and 634 will utilize Cavello pass; operations out of Ingleside and Rockport will utilize Aransas Pass and neither transportion plan will necessitate consistent or regular vehicle traffic through the Critical Habitat area.

Brown pelican (Pelecanus occidentalis)

The brown pelican was listed originally as Endangered on October 13, 1970. The bird normally ranges on the eastern seaboard from North Carolina to Florida and around the gulf coast of Texas and Mexico, southward to Venezuela as well as the West Indies and islands of the Caribbean. A small population of about 50 invividuals exists in Texas and is increasing slowly. Louisiana populations are those restocked from Florida since 1968, plus offspring from those birds since 1971. This new population suffered a decline of approximately 40 percent from Endrin pollution in 1975 and now numbers about 200 birds. Both Carolina populations are relatively small and nearly stable. In Florida a stable population of 20,000 - 30,000 is reported. Critical Habitat has not yet been determined for this species.

The major food of the pelican is fish, including menhaden, mullet, sardines, and pinfish. The pelican catches these fish by plunge-diving in coastal waters. Brown pelicans are rarely found away from saltwater and typically do not venture more than 20 miles (32 km) out to sea. Extensive use of pesticides which were ultimately ingested by the brown pelican has been noted as the primary cause of the current population decline.

The brown pelican is extremely susceptible to disturbance and habitat alteration of key nesting areas. It is imperative to prevent disturbance of nesting colonies that could cause nest desertion and egg losses. Transport operations conducted out of Port O'Connor and Ingleside/ Rockport through Aransas pass should be cognizant of and avoid disturbance of the following nesting islands: Sundown Island in Matagorda County, Second chain of islands in Aransas County, Long Reef in Aransas County, and Pelican Island in Nucces County.

None of the presently considered impacts of the proposed exploration of OCS tracts, however, are considered of sufficient probability or magnitude to be likely to jeopardize the continued existence of the brown pelican. However, any activity or program resulting from this proposed sale which is authorized, funded, or carried out by a Federal agency and which may affect active nesting sites or sites necessary for expansion of nesting (identified in the draft Brown Pelican Recovery Plan) will require Section 7 consultation.

Atlantic Ridley (Lepidochelys kempii)

The Atlantic Ridley sea turtle was listed orginally as Endangered on December 2, 1970. By Memorandum of Understanding with the National Marine Fisheries Service (NMFS), jurisdiction of the Ridley, for matters relating to the Endangered Species Act of 1973 rests with the NMFS while the Ridley is in its aquatic environ, and with the FWS while onshore.

The Endangered Atlantic Ridley sea turtle inhabitats the Gulf of Mexico. Ridleys occur along the Atlantic coast as far north as Massachusetts and are sighted infrequently along European shores. Critical Habitat has not been determined for this species. The essential habitat of the Atlantic Ridley includes shallow coastal and estuarine waters often associated with subtropical shorelines of red mangrove. In the U.S. this species is believed to sporadically nest in Kleberg, Kenedy, Willacy and Cameron Counties, Texas. The entire population now nests primarily on approximately 24 km of beach in the State of Tamaulipas, Mexico. Nesting female population estimates for 1947 were 40,000; 2,000 to 4,000 in 1973; and 400 to 500 in 1976. Currently, there exists an International Inter-governmental project to reestablish a viable population on Padre Island National Seashore. In 1978 turtle eggs were collected in Mexico and hatched and imprinted in the U.S.

Portunid crabs (Callinectes sp.) make up a large portion of the diet. These turtles also feed on other crabs, shrimp, snails, echinoderms, medusae, and fish. The northern gulf off the coast of Louisiana has been identified as a major feeding area.

Commerical harvesting of the Atlantic Ridley and their eggs has played a significant role in the decline of this species. Predation by crabs, fish, reptiles, birds and mammals is acute, especially on eggs and hatchlings. Predation on adults is limited to sharks. Atlantic Ridleys also are caught incidental to commercial fishing activities which result in entanglement and subsequent drowning in the trawlers' nets.

Although the Atlantic Ridley is believed to nest on Padre Island and on the beaches of Kleberg, Kenedy, Willacy and Cameron Counties on the Texas gulf coast, the proposed sale and subsequent activities are not likely to jeopardize the continued existence of the Atlantic Ridley sea turtle unless development involves Padre Island and the above mentioned counties. Should future actions involve Federal agencies authorizing,

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funding, or conducting activities or programs on Padre Island or the beaches of Kleberg, Kenedy, Willacy and Cameron Counties, Texas, especially the restoration and enhancement efforts for the Atlantic Ridley turtle population on Padre Island National Seashore, Texas, Section 7 consultation will be required.

Conclusion

Based on my consultation team's review of the above information and other information and data available to the Service, it is my biological opinion that exploration of the identified OCS tracts, subject to the previously stated conditions, is not likely to jeopardize the continued existence of the Endangered species considered herein or result in destruction or adverse modification of their Critical Habitats. The conclusion is predicated on data provided concerning helicopter and vessel routes and their frequencies. Any Federal action that is authorized, funded, or carried out that significantly increases the boat trips through Critical Habitat of the whooping crane and proportionately increases the risk of collision and/or oil and hazardous substances spill will require reinitiation of Section 7 consultation. Similarly, any Federal action which poses a threat of disturbance to brown pelican nesting islands or Atlantic Ridley nesting beaches on Padre Island will require reinitiation of Section 7 consultation.

Attachment

END

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